THE UNITED STATES DISSECTOR:

OR,

LESSONS IN PRACTICAL ANATOMY.

BY

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FIFTH EDITION,

CAREFULLY REVISED AND ENTIRELY REMODELLED,

BY

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TO THE

MEDICAL STUDENTS OF THE UNITED STATES

The following Pages,

ESPECIALLY WRITTEN FOR THEIR INSTRUCTION

BY THE LATE

WM. E. HORNER, M.D.,

ARE RESPECTFULLY DEDICATED

AS AN

INCENTIVE TO CONTINUED ANATOMICAL INVESTIGATION,

BY

THE EDITOR.

PREFACE

TO THE

FIFTH EDITION.

THE preceding edition of the United States Dissector was edited by myself, at the request of the author. In that edition, I made such modifications of arrangement, &c., as were deemed most likely to aid the student's progress in the Dissecting Room. Since its publication, the hand of death has been laid upon Dr. Horner, in the midst of his labors for the anatomical instruction of those to whose interests he was so ardently devoted.

In order to meet the continued wants of a new generation of students of anatomy, I have again carefully revised the text, modified its order, added an entire new set of illustrations, and introduced such recent subjects as the progress of the science rendered necessary. In doing this, I have made such slight modifications of the text as were essential to the unity of the description, and I have done so with the greater freedom, as permission to use my own judgment in this matter had been accorded me by the author in the former edition.

In passing the sheets through the press, I have been aided by my friend, Dr. Agnew, of Philadelphia, to whom I am also indebted for two articles, which will be found in the text under the signature of [A]. The principal additions of the editor are marked [Ed.], or simply [ ]. Trusting that the present edition will tend to facilitate the student's progress as much as the preceding have done, it is again presented to him as a useful guide in the labors of the Dissecting Room.

HENRY H. SMITH,

120 S. Ninth Street.

Philadelphia, Oct. 1853.

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THE DISSECTOR.

CHAPTER I.

PRACTICAL ANATOMY.

[The word Anatomy—which is derived from two Greek words, ανα, up or through, and τεμνειν, to cut—literally signifies a dissection or cutting up of the different structures of a body. General usage has, however, given it a more extended meaning, and appropriated it to the study of all the details of the structure of an organized being. The term Dissection, among medical men, is therefore generally restricted to such manual operations as are requisite for the display of different portions of the animal structure, and it is in this sense that it, or the term Practical Anatomy, is now used. As the student in dissecting desires to become acquainted with every portion of the body, he will, of course, examine them all thoroughly; but, as it is desirable to have the part to be dissected as fresh as possible, it is usual to commence with those regions which are most likely to suffer from decomposition. With this view, the parietes of the abdomen are often the first to be dissected, as the removal of the intestines tends to preserve the purity of the atmosphere in the room, and thus adds to the comfort of the dissector. Should there be other portions of greater interest at the moment, the student may, however, proceed at once to their investigation, by following the order pursued in any of the chapters of this work, each one being complete in itself.]

SECTION I.

ON DISSECTING.

Before engaging in the work of the dissecting room, the student should obtain a dissecting apron, which is usually made of some coarse material, with sleeves to button close at the wrists, of sufficient length to reach from the neck half-way down the legs, and so loose as to permit perfect freedom of motion.

He should next obtain a *good** Dissecting Case, which should contain at least four knives, technically called scalpels (from *scalpo*, I cut), one single hook or tenaculum (from *teneo*, I hold), one double hook, or a small chain with three hooks attached to its ends, one pair of dissecting forceps, one pair of sharp-pointed scissors, one blowpipe and two strong curved needles. He will also find three long straight awls and a common hone and strop, such as may be obtained of the hardware merchant, of service in certain portions of his operations.

As young students are sometimes fearful of contracting diseases whilst pursuing their dissections, it may prove useful here to state that the use of the salt mixture, or of the chloride of zinc, as hereafter mentioned under the head of Injections, tends to remove all danger from this source, by arresting the decomposition of the body. Besides, subjects with smallpox, &c. are never received in well-regulated dissecting rooms. Anxiety is also sometimes excited lest inoculation be induced from slight punctures of the hand or from abrasions. This is also in most instances (at least in the United States) a rare event. To guard against all danger, it will however be safer to cover the abraded spot with a little collodion previous to dissecting. In case of a wound, the part should be immediately washed, and then sucked so as to encourage bleeding, or, if more severe, a cupping-glass may be applied over it.

In dissecting, everything should be kept in as perfect

* Good dissecting instruments are best obtained directly from cutlers of established reputation.

order about the table as possible; the instrument cleansed when no longer wanted for use, and honed or stropped at proper intervals.

Cleanliness about the room is also of the first importance; the dissector should, therefore, never suffer his table to become foul from blood or pieces of flesh standing on it, neither should he permit blood to remain in the different depressions about the subject, when it can be conveniently removed. He should keep also a sponge for himself, for where a sponge is used by several it becomes nobody's business to clean it; the consequence is that it is seldom fit for use. When the integuments of a subject are laid open, the parts exposed either dry or putrefy rapidly. A constant rule is hence established, not to turn down more skin than the freedom of dissection requires, and to save it as much as possible to cover the parts again, when the dissection is suspended for an interval. When there is not enough of it for this purpose, a damp cloth, several folds thick, should be at hand to assist in covering. It will also prove useful to cover the entire subject with a cloth at the termination of each day's work.

In order to dissect neatly and rapidly, the scalpel should be held like a writing-pen in the right hand; when muscles are dissected, it should be exclusively used for cutting, as the scissors do not answer. The integuments of the parts covering the muscles, as well as all portions which are being dissected, should be held perfectly tense with the other hand or with the forceps. The scalpel should be passed with a steady and light stroke in the direction of the muscular fibres, and in such a way as just to graze them. This latter rule is indispensable; no one can dissect a muscle well, without observing it, and it should be continually present to the mind of the student.

In order to dissect with comfort or satisfaction, it is of importance that a good edge be kept on the scalpels employed; and as many are ignorant of the proper manner of sharpening instruments, the following directions may prove useful.

SECTION II.

SETTING SCALPELS.*

"Bearing in mind that a cutting edge is the apex of a cone, more or less elongated, it will be easy for any one to judge of the various degrees of inclination to be adopted in gliding the knife along the surface of the hone—recollecting that the edge is to be kept foremost, so as to gather the oil spread on previously. This must be done alternately to each side, holding the instrument steadily, but still with a light hand. If it is to be used for cutting dense matter, the back of the scalpel should be held above the level of the stone, at an angle of 30 degrees; if for cutting a delicate membrane, the back should be held so as to touch. It is a very common practice to lay on heavily when setting; this is bad, as it has a tendency to produce a wire edge which entirely prevents the instrument from cutting. If the edge should be blunt, a Turkey stone is to be used first, then a German hone, and finally a hard green stone (called 'Charley Forrest') which is found in some parts of England. To instruments not much blunted, razor paste, spread on a strap or a piece of smooth hard wood, will give a fine edge."

In the United States, the Arkansas hone or whetstone is justly admired for its fine, sharp grain, and, when properly used, renders a finishing strap unnecessary. Hones which are sufficiently fine for ordinary purposes may generally be obtained of the hardware merchants.

SECTION III.

OF INJECTIONS.

Injections of different substances are usually made before commencing the dissection, either to aid in the preservation of the subject, or to render the bloodvessels more distinct. They are of various kinds. Swammerdam first used wax injections about the year 1672. Corroded

* Tulk and Henfrey, Anat. Manipulation, London, 1844.

preparations were first made by Francis Nicholls, Professor of Anatomy at Oxford, about the beginning of the last century. Rouhaut, a surgeon of the King of Sardinia, first dissolved glue to inject small vessels. Homberg, of Paris, proposed a mixture of equal parts of tin, bismuth, and brass, wherewith to inject bloodvessels by means of a pneumatic apparatus for forcing it in.

There are three kinds of injections in use among anatomists for the distension of the bloodvessels, the Coarse, the Fine, and the Minute; which are thrown into the arteries and veins when it is desired to demonstrate their course more satisfactorily than can be done in their flaccid condition.

For Coarse Injections, select from the following Formulæ:—

No. I.

Yellow Beeswax, pure, ℔j.
Bleached Rosin, ℔½.
Turpentine Varnish, by measure, ℥vj.*

Mix.

No. II.

Yellow Rosin, ℔j.
Yellow Beeswax, ℔½.
Turpentine Varnish, a sufficient quantity to make the mixture flexible when cold.†

Mix.

No. III.

Tallow, ℔j.
White Wax, ℥v.
Common Oil, ℥iij.
Venice Turpentine, or Rosin, ℥ij.‡

Mix.

* Fyfe, Pole. † Nicholls. ‡ Monro.

No. IV.

Common Rosin,
Beef Tallow,
Beeswax, of each ℔½.

Mix.

This mixture penetrates well, and though it has some flexibility in the winter, it yet withstands the warm weather in summer.

For making either mixture,		Red;	add Vermilion, ℥iij.
do	do	Yellow;	King's Yellow, ℥ijss.
do	do	White;	Best Flake White, ℥vss.
do	do	Pale Blue;	Best Flake White, ℥iijss. Fine Blue Smalt, ℥iijss.
do	do	Dark Blue;	Blue Verditer, ℥xss.
do	do	Black;	Lampblack, ℥j.
do	do	Green;	Powdered Verdigris, ℥ivss. Best Flake White, ℥jss. Gamboge, powdered, ℥j.

No. V.*

Beef Tallow, ℔ij.
Calcined Magnesia, ℥ss.
Chinese Vermilion, ℥j.

Mix.

Liquefy the above mixtures over a slow fire, or, what is still better, in a water-bath.

No. VI.

When the student wishes only to prosecute the dissection of the vessels without making a preparation of them, the following injection will answer:—

* Dublin Dissector. This is a good injection, and may be used, to some extent, without previously heating the subject.

Tallow, ℔ij.
Turpentine Varnish, ℥x.
Red Lead, ℥viij.

Mix.

This mixture retains its fluidity, when melted, for a long time; and may be thrown from the arch of the aorta through the primitive and many of the secondary arterial trunks, without heating the subject. Its cheapness makes it very advantageous.

The success of this injection will be increased by throwing in first a syringe full of No. IX. or X. properly heated, with a view of warming the vessels and removing their rigidity.

No. VII.

A commodious formula, and, for the most part, a very successful one, has been in use in Philadelphia for many years. It is also much approved, I have understood, in other parts of the United States, and is commonly called the Cold Injection, from its not being necessary to heat it. To make this mixture, take

White Lead and Red Lead, of each ℥iv.

Linseed Oil enough to form a thick paste by rubbing them well together. Liquefy this paste with Turpentine Varnish, ℥viij.

Just before injecting, sprinkle the mixture with cold water. The advantage of it is, that it does not require the subject to be previously heated. The color may be improved with vermilion. As making a mixture each time a subject has to be injected is rather troublesome, a larger quantity of the ingredients, with the exception of the varnish, may be blended, and then kept fluid for a long period by pouring water into the vessel. After the varnish is once added, the mixture must be used immediately, as it then begins to thicken. This is a very popular injection, and several persons have supposed themselves to be the inventors of it. I have been informed by the Right Rev. Bishop Onderdonk, of Pennsylvania, in early life a physician (having studied under the celebrated Dr. Post, of New York), that it originated with Mr. Allan Ramsay, a Scotch anatomist.

These ingredients are used in various proportions by different anatomists, and it may be found advantageous to increase or diminish their relative quantity according to circumstances.

[Plaster of Paris, with water, is also sometimes employed, by rendering it quite thin, or about the consistence of cream. It hardens, however, very rapidly, and is apt to prove very brittle. It is also apt to injure the syringe unless it is promptly cleansed. It may be colored by the addition of a little Red Lead.]

The Red Lead is more drying than the White, and is sometimes used without the other, as follows:—

No. VIII.

Red Lead.

Linseed Oil sufficient to bring it to the consistence of putty.

Then equal parts of Spirits of Turpentine and Turpentine Varnish, until it is reduced to a semifluid state.

Just before injecting, sprinkle it with a little water and stir it.*

White Lead, treated in the same way with linseed oil and turpentine varnish, may have its color changed to fancy, by any of the coloring matters mentioned. It is not necessary to strain these lead mixtures.

For Fine Injections, take the following:—

No. IX.

Brown Spirit Varnish, ℥iv.
White Spirit Varnish, ℥iv.
Turpentine Varnish, ℥j.

Mix and heat.

* Charles Bell's System of Dissections, London, 1809.

To make this mixture		Red;	add Vermilion, ℥j.
do	do	Yellow;	King's Yellow, ℥j¼.
do	do	White;	Best Flake White, ℥ij.
do	do	Light Blue;	Fine Blue Smalt, ℥jss. Best Flake White, ℥j¼.
do	do	Dark Blue;	Blue Verditer, ℥iv.
do	do	Black;	Lampblack, ℥ss.

Or, No. X.

According to Dr. Monro, a Fine Injection may be obtained, by pouring oil of turpentine on any finely powdered coloring matter, till it reaches a proper consistence.

For Minute Injections, take the following:—

No. XI.

Most transparent Glue, broken to pieces, or Isinglass, ℥viij.
Water, ℔iss.

Mix.

Let it stand till the glue is soft, which will take from one to two days. Then heat it gently till the consistence is uniform, or a perfect size is made.

The Isinglass is much more expensive, but more minute. As glue varies much in strength, this quantity of water must on some occasions be reduced. I find it a good rule after soaking the glue to pour off the free water.

To make this mixture		Red;	add Vermilion, ℥v.
do	do	Yellow;	King's Yellow, ℥iv.
do	do	White;	Best Flake White, ℥v.
do	do	Blue;	Fine Blue Smalt, ℥viij.
do	do	Green;	Powd'd Verdigris, ℥iij. Best Flake White, ℥ij. Gamboge, powdered, ℥ij.
do	do	Black;	Lampblack, ℥j.

Or, No. XII.

MINUTE INJECTION OF PROFESSOR BERRES.*

Copal Varnish, prepared with Alcohol.

Gum Mastich, dissolved in about the sixth part of Spirits of Turpentine. Equal parts.

Mix.

These materials are brought by gentle heat to a proper consistence, which may be known by letting a drop fall upon a stone. If the drop be quickly reduced to a homogeneous, pure, honey-like mass, tenacious and ductile, it is fit for injections.

The mass is then to be made of a suitable color with factitious cinnabar of the best quality, rubbed down with spirits of turpentine. This mixture must be well strained into a warm vessel, and its heat sustained in a sand-bath at the time it is used.

When veins and arteries are both injected, the veins should have precedence.

The injection finished, the parts are to be immersed at once in cold water, and retained until their temperature is settled.

Parts thus prepared exhibit the smallest vessels turgid and sufficiently hard to be dissected without the injection flowing out. They present an agreeable appearance, and are most convenient for the microscope. For a long series of years they increase in beauty and elegance, by the evaporation of the fluid materials of the injection and the drying of the part itself, exposing more and more the turns of the turgid vessels.

When there are vessels too fine to be filled with the above, Professor Berres recommends a preparatory injection of spirits of turpentine or of glue, brought to a proper color. It answers very well to draw first into the syringe some of the resinous injection, and in the second place the other. In its expulsion, the finest injection will return first and be followed immediately by the other.

* Anatomia Partium Microscopicarum Corporis Humani, p. 23, Vienna, 1836.

[Common sulphuric ether, with some fine coloring matter, will be found to furnish a most minute material for injection, as it will enter the fine capillaries. As the ether evaporates, the coloring matter is left in the vessels.]

In all of these formulæ for Injections, it is of the utmost importance to success in the use of them, to have the colors in the purest condition and reduced to the finest powder by levigation or trituration. In Philadelphia they are found, for the most part, in a state fit for use in the Druggist's, and Painter's and Glazier's shops. But to render the process still more certain, it is better to strain the mixtures, after the colors are added (the cold injections excepted), through a fine flannel cloth, which will arrest the impurities both in the original mixture and in the coloring ingredients.

In the use of the first four formulæ, it is indispensable to warm the subject thoroughly by previous immersion in water hot enough to excite the sensation of scalding in the finger, say at from 110 to 115° Fahr. If the water be too warm, it will cause the parts to contract and to become rigid instead of softening them. The injection must be of the same, or even of a somewhat higher temperature.

No. I. is used for corroded and dried preparations. Nos. II. III. IV. and V. for the latter alone. Nos. VII. and VIII. answer remarkably well for dried preparations, but are very brittle; it takes about twenty-four hours to harden them; the part injected should, therefore, not be disturbed till the expiration of that period. No. IX. or X. is sometimes used as the precursor to the first three. No. XI. is adapted to wet preparations, and such as are intended to demonstrate minute vascularity.

The student acquainted with the circulation of the blood, will always know where to fix his pipes when an injection is to be accomplished, whether arterial or venous, or both. It is therefore unnecessary to extend this notice by describing the method of proceding in each individual preparation, general rules being sufficient, and to the intelligent mind much more acceptable.

The more limited the range of an injection, the more likely it will be to succeed well, as the force of the syringe is thereby concentrated. Hence, a rule is established to put the pipe as near as possible to the part intended to be injected.

SECTION IV.

MEANS FOR THE PRESERVATION OF SUBJECTS AND PREPARATIONS.

Various plans and substances have been proposed for this very desirable object, but there are none, as yet made known, which meet every requisite. Antiseptic articles are sufficiently abundant, it is true, and will be found in many of the metallic and alkaline preparations. The most prominent among the former, are white oxide of arsenic and muriate of mercury; and among the latter, are muriate of soda, nitrate of potash, muriate of ammonia, the aluminous salts, and some others. There are very few neutral salts indeed which do not possess, to a limited extent, this property. Alcohol and its several preparations are, in many respects, unexceptionable. We also have the various vegetable and mineral acids: creasote, the essential oils, especially that of the pinus sylvestris, elain, stearin, &c. &c. The catalogue is indeed, very numerous, of articles having a power to resist the decomposition, by putrefaction, of animal matter. A substance, however, to be unexceptionable, must possess an absolute antiseptic property—it must not vitiate the color of organs, neither must it affect their texture so as to alter materially or objectionably their consistence; and last of all, it should resist the process of drying, so that parts will remain flexible and of full volume as in life. It is difficult to say, whether any anatomist has succeeded in his art to the degree of perfection thus demanded. If the accounts of Ruysch and his preparations be not exaggerated, he would seem to have accomplished all of these points, but by what process is now entombed with him.

Having tried, to some extent, nearly all the principal articles in the foregoing category, my preferences have settled down decidedly in favor of two or three of them, to wit, the muriate of soda, nitrate of potash, and alcohol. The two former for the preservation of bulky articles, by injection and by external application—the latter by steeping.

The formula which I have now used for twenty-five years, with some slight changes, as experience directed, is as follows :—

Liverpool, St. Ubes, or Turk's Island Salt, .	℥xxxvj.	avoirdupois.
Nitrate of Potash, . .	℥xix.	"
Carbonate of Soda, . .	℥viij.	"
Molasses (sugar-house), .	℥iv.	by measure.
Starch, ...	℥ij.	
Water, ...	Ovj.	

Mix.

In the preparation of the above, which is sufficient for one subject, the saline constituents are to be thoroughly dissolved first of all in the boiling water. The molasses is afterwards stirred well in. The starch should be first mixed up with cold water, Oss., and the lumps fully reduced; in that state, it is stirred gradually in with the other articles, and, as soon as they begin to boil again, the whole mass swells up, and in that state should be immediately removed from the fire; on the proper reduction of its temperature it is then fit for use. I generally make several gallons of this mixture at once, to have it at hand; but its quality is somewhat impaired by keeping. The molasses develops a fine aroma at the boiling temperature of this solution, and the starch imparts a proper consistence. The soda prevents instruments from being readily acted on by the compound. Any one or more of the above ingredients may be increased or diminished from their relative quantity to meet especial intentions. Some regard must be had, however, to the muriate of soda and the nitrate of potash, as any great excess above the quantities stated, in going too far beyond the point of saturation, will make a simple mixture clogged by the uncomminuted and undissolved particles. If the desire be to color up the muscles very highly, the molasses may be used more freely; if the appearance of the nerves and of the white tissues is to be preserved, the quantity may be decreased to a minimum. The soda may be left out entirely; but, when in, it has the property of preventing the main ingredients from hardening too much the tissues injected. If the subject to be injected is loose and somewhat œdematous, the mixture should be made thicker with starch, the object of the latter being to regulate percolation.

The best way of introducing the above mixture is as follows: The sternum should be divided longitudinally through its middle; and to get at the heart, the Sternum Dilator should be used.* The two divisions of the instrument, acting each upon its side respectively of the sternum, the latter parts open four or five inches. The pericardium is then slit up, and a large pipe introduced into the root of the aorta. A syringe will do for throwing in the mixture; but the best way is by a column, of twelve or eighteen feet in height, to which for convenience is attached a flexible tube of leather four feet in length, to conduct the injection to the aorta-pipe; the tube should be furnished with a stopcock at the lower end. By this apparatus, the pressure can be so exactly regulated as to keep the vessels full without rupturing them, and the injection be pushed uniformly on. In all cases where it succeeds well, it returns by the veins, and keeps them beautifully distended as in exercise. It should be thrown in warm.

Injection through one of the collateral arterial trunks is not so effectual as from the aorta itself. I have, for the purpose of saving the sternum, tried the brachial, the femoral, the carotid, and some other arteries, but always with some measure of disappointment.

If the subject is to be used immediately, the above quantity will hold it in good preservation for two months in winter; if it is to be kept during the summer, and for an indefinite length of time, twice the quantity should

* See vol. iii. p. 242, Am. Journ. Med. Sc. Nov. 1828.

be injected; or even more, if the subject be very large. The objection to using the latter quantity, where a subject is to be dissected at once, is, that it inundates rather too much; but where time is left for evaporation, the latter process corrects the over-humidity.

If a subject is to be kept during the whole summer, it should be preserved besides in a mixture of one part of common salt to four of mahogany or pine sawdust; and, to prevent its becoming too dry, it should be sealed up in lead, or surrounded by a cloth which is impenetrable to moisture, or by some other of the numerous means of insulation from the atmosphere, as a box covered well with pitch, or an old oil-barrel or hogshead. A subject may be kept in this way, fit for most anatomical purposes, for an indefinite length of time. If the investment used fail in preventing evaporation, and the limbs get hard, they may be soaked out to a proper suppleness. Insects have no disposition to molest such pieces in their dried state.

The above injection impairs the great nervous centres, as the brain and spinal marrow; also, the mucous membranes and the rete mucosum, by softening them and making them pulpy; a proof by the way of the quantity of neurine and nervous fatty matter entering into the composition of the rete mucosum. This influence is derived from the free alkaline matter in the injection coalescing with the neurine, and making a half diffluent soap. Hence, the cuticle always parts in ten or twelve days. Leaving the alkali out will correct this, but with another disadvantage in its place, to wit, the too great hardening of the tissues. The accident is, at best, but unimportant, as a roller imbued with tallow or wax, laid down in place of the cuticle, will resist the drying of the skin at the part.

The muscles are beautified to a remarkable degree by the above injection, and are also preserved in a fine state of strength and tonicity. I resort to it invariably in my demonstrations of the muscles, and have done so since its first adoption, and should consider my arrangements incomplete without it. Whether my partiality is justified must, however, depend more upon the evidence of some thousands of young men who have been trained in their anatomy by me.

Anatomical pieces preserved this way do not make good spirits of wine preparations for suspension; the salts and the molasses are constantly tinging that fluid. If the pieces are to be shown by direct handling, the turbidness of the fluid is inconsequential, and the muscular fibre, though its color is changed by the spirits of wine into a dark olive, yet has its character very strongly developed in parts where it may previously have been equivocal. The fibre is also rendered somewhat more brittle, and the cellular substance more distinct by it. A muscle thus treated becomes a fine subject for unravelling and for study. The arteries distended in this way are for a short time rendered very soft and extensible, and then receive a much fuller amount of the common coarse injections. Some delay should be had before the latter, so as to allow the antiseptic injection to pass on, and the aorta should at any rate be emptied of it. This injection has a fine effect in developing the tissue of an artery, especially if the latter be afterwards steeped in alcohol.

The skeleton, the ligaments, and the cartilages, are made extremely firm by the above injection, so that in boiling the gelatin is not formed so readily; and maceration in water seems to produce, even in very hot weather, scarcely any effect in accelerating the putrefaction of these parts. Skeletons thus injected, though much more durable and heavy, when prepared by boiling, than others, yet never can be well bleached, but always retain a brown tinge.

Upon a dissected surface, a soapy, glairy formation will occur after a few hours' exposure to the air; this may be partially corrected by an envelop saturated with tallow, or with molasses and water.

As to the vaunted preparations of arsenic, they are certainly antiseptic, but poison the dissector's fingers, add nothing to the qualities of the parts for dissection, and indeed rather impair them. The Sulphate of Alumina, recommended by Mr. Gannal, of Paris, is also antiseptic, like all the other forms of this earth, but spoils completely the color of the muscles, and also hardens them and other parts too much. It has in this respect a similar effect to corrosive sublimate, which of all articles is the most potent, both for preventing and for arresting putrefaction; but like arsenic exposes the health of the operator, and also, by its ready action upon the albuminous constituent of the tissues, confounds them all into a hard, drab-colored, undistinguishable texture.

[The same remarks are true, to some extent, of the following article. But its antiseptic properties facilitate the preservation of subjects to such a degree as to render it most useful in the dissecting room, especially as it does not injure the knives or the health of the dissector.

Chloride of Zinc.

This most excellent antiseptic injection is one now generally adopted in the dissecting rooms of Philadelphia. So efficient is this preparation that dissections may be conducted in midsummer without the least inconvenience. It is made by the addition of the common muriatic acid to metallic zinc, in the proportion of four or five pounds of the metal to one gallon of the acid, the compound being allowed to stand thirty-six or forty-eight hours. It should be made in a strong stone vessel; and after its preparation a small quantity of metallic zinc should be allowed to remain in the vessel, in order to combine with any free acid which may be present. When used as an injection, it should be mixed in the proportion of one-third water to two-thirds of the chloride of zinc. One quart of the mixture thus prepared will be sufficient for an adult subject, and if desired, the arteries may be injected with tallow, plaster, &c. five or six hours subsequently.]

I will make a few remarks on alcohol, or spirits of wine, from my own observation. There is no other fluid which I think equal to it for wet preparations; and those who claim for the dilute acids, and the solutions of neutral salts, an equal value, have overlooked too much the constant precipitating of their solid constituents, so as to obscure the preparation, and make the fluid finally turbid; at least I have tried none against which this objection did not hold. When alcohol is used, the blood should be removed from the specimen by soaking it for a time in clear fresh water, frequently changed; then, at least three times its weight of alcohol should be taken, and the specimen so arranged that the alcohol shall be in contact with its whole surface; massive pieces should be cut into, to give to the alcohol a proper access. When the preservation of the white tissues is concerned, the alcohol is very exactly suited to them. The strength usually employed by me is about 26° of the glass float of Cartier, or 60° of the centesimal float of Gay-Lussac. A bulky anatomical specimen, from the quantity of water it discharges, will dilute the spirits of wine probably six or eight degrees, and a great state of dilution always incites to softening and maceration, so as to spoil the piece.

A good spirits of wine preparation, properly made and suspended, is constantly improving in the perfection of its appearance; and is decidedly better at the end of twenty years than at the beginning of them, so far as the condition and aspect of the tissues are concerned. Alcohol can generally be obtained of the strength named, at seventy cents a gallon; it is therefore not very expensive in this country, to keep up anatomical cabinets of wet preparations. In Europe, the excise duties impose a much higher price, and the anatomists are, therefore, constantly attempting to adopt a cheaper substitute.

Wet preparations should be exposed freely to the light of the sun, otherwise their texture is injured by its absence, and they acquire a dark ugly drab color; this is especially the case with ligamentous tissues, and with the great nervous centres.

It is difficult to get glass or stone vessels of sufficient size for large anatomical pieces, to be kept in spirits of wine. Vats of lead are used to some extent, but a carbonate of lead is formed in great quantity, which being precipitated on the specimen, spoils its surface, and makes it ragged and opaque. I have tried zinc partially, and find it to answer better, but time is wanted to mature the observation.*

* American Journal of Medical Sciences, No. xvii. Jan. 1845, p. 245.

§ 1. DRIED PREPARATIONS.

Whenever a section of the body, as the head, the arm, leg, or any other part, is to be injected, the arterial pipe must be fixed into its principal trunk or trunks; and the venous pipe into one of the extreme branches. A very common, and, indeed, the most frequent source of disappointment to the young anatomist, is the neglecting to take up such vessels as are cut in the separation of the part. It may be avoided by blowing into the pipes when fixed, whereby all the ramifications being inflated, such as are cut can be thus easily found out and secured.

Male subjects, from birth till the age of twenty-five or thirty, answer best for dried preparations of the greater part of the arterial system. After thirty, few subjects answer well in consequence of a profusion of adeps blending itself with the muscles, and not unfrequently of a diseased state of the arterial system.

In dried preparations, the arteries should be fairly traced in all their ramifications, and the muscles separated from each other. Everything not essential to the object of the preparation must be cut away. When the part is fully dissected, care should be taken to put every portion of it in a proper posture, and to fix it so till it becomes stiff by exposure to the air. The muscles are to be kept asunder by strips of wood.

When the preparation is thoroughly dried, and not before, it should be varnished. But previous to the latter process, it should be washed twice with a solution of caustic potash, in order to remove a greasy coat which it is apt to form on its surface. It should afterwards be washed with water to remove the soap that results from the application of the potash. Soap-boilers' lye answers perfectly, in the place of the caustic potash of the shops. Dried preparations suffer much from insects, and the best security for them is obtained by immersion in a solution of corrosive sublimate, till they become impregnated with it; they may afterwards be put in position and dried. If they are too large to subject to this process, even after they are dried, they may be washed four times advantageously with this solution:—

Corrosive Sublimate, ʒj.
Muriate of Ammonia, ʒjss.
Water, . . ℔j.

At the last two washings add to the foregoing,

Common Glue, dissolved, ℥j.

The glue makes the solution adhere to the preparation, and also furnishes for the varnish a basis or ground, which causes it to stick and dry well. Two thin coats of copal varnish must afterwards be laid on with a soft brush.

Copal varnish will take up a small quantity of corrosive sublimate; hence, I find it in many instances sufficient to resort to that coating, from the aversion the insects have to it.

To make a preparation which will show perfectly the shape and communication of the air-cells of the lungs, the lung should be previously filled through the bronchus with melted tallow. When the latter cools, the lung should be cut into thin slices and dried. The pieces are then to be digested for some days in spirits of turpentine at the temperature of about 110°, so as to dissolve out the tallow. Should the bloodvessels of the lung have been minutely injected with size previously, a most brilliant set of preparations can be made, which may be mounted either in the dry state, or suspended in spirits of turpentine.

§ 2. CORRODED PREPARATIONS.

The heart, lungs, liver, spleen, pancreas, kidneys, and penis, are most commonly chosen in making corroded preparations. Their vessels, excretory ducts, and cavities, as the case may be, should be distended moderately with No. I., observing to give to each system in the structure of the viscus a color different from the rest. The successful injection of these requires good management; because, if too much force be used, extravasation will occur, and the preparation will be materially disfigured.

After injecting it, the preparation is to be laid in a mixture of three parts of muriatic acid, with one of water, which corrodes the fleshy part and leaves the injection exposed. The process of corrosion occupies from three weeks to two months, according to the bulk of the viscus. The acid becomes weakened during the time, and we should, therefore, every week, add enough of the fresh, to bring the mixture to its original strength.

When the animal part is converted into a soft pulp, the preparation must be taken out of the mixture with the greatest care and subjected to a small gentle stream of water, which washes off the pulp and leaves the vessels bare. If the corroding process be unfinished, the part must be replaced in the acid mixture and kept there till it is completed. On the pulp being removed, let the preparation remain floating in water for twenty-four hours, in order to remove any acid which may adhere to it; then dry it by suspension in the air, or by laying it on a heap of soft carded cotton covered with a thin cambric cloth, to prevent the cotton from sticking to its vessels.

The preparation should be fixed on a pedestal of plaster of Paris, and coated by dipping it into copal varnish, diluted with one-half of its quantity of spirits of turpentine. It should, after drying, be varnished in the same way once more. Such preparations, when kept under glass bells or cases, are among the most beautiful that can be made.

As corroded preparations break from the slightest violence, I have used, with great improvement to their strength, a size of isinglass, into which they were dipped; by repeated applications of this they become well coated with it, and thereby too strong to be injured by slight jars.

§ 3. WET PREPARATIONS.

Minute injections, and all morbid derangements, are proper subjects for wet preparations. The natural structure of many parts is also very advantageously displayed in this way. The specimen, previous to being put up, should be steeped in water, changed daily, till all the blood is out.

Spirits of wine, spirits of turpentine, and a solution of corrosive sublimate, are each suitable for suspending such preparations. The latter answers particularly well for eyes and for thin membranous parts, as an intestine, &c. Two grains of corrosive sublimate, with an equal quantity of muriate of ammonia, to an ounce of water, make a solution sufficiently antiputrescent for an eye, and which contracts the preparation much less than spirits of wine. When larger bodies are preserved, the quantity of corrosive sublimate must be increased proportionably.

Corrosive sublimate with, in fact, all saline solutions, has, however, the disadvantage of precipitating after awhile.

Bottles for wet preparations should have wide mouths, short necks, and broad heavy bottoms. The preparation being properly displayed and suspended, the mouth of the bottle must be secured with a bladder; over this must be placed sheet lead, about the thickness of a quarter of a dollar, and trimmed so as to correspond in size with the top of the bottle; over this lead another piece of bladder is to be stretched and secured. The outside bladder, being properly trimmed, should be varnished twice with copal varnish colored with lampblack.

In later years, a plan which I have found to answer better than any other for closing bottles, so as to prevent evaporation, is to have the upper end, *i. e.* mouth and neck of the bottle, in the shape of two short truncated cones joined at their summits. This shape accommodates well a cross-bar of white metal, as pewter, to which the preparation should be suspended through holes. If *spirits of wine* be used, a waxed muslin should be attached by heat to the under surface of the leaden cover, and while still warm be fixed in its place, and then covered by two layers of bladder. If the menstruum be *spirits of turpentine*, the best cover is a moist bladder coated with dissolved glue, containing a small quantity of honey, or of some saccharine substance to make it less brittle. Upon its drying, a lead may be secured over it by another layer of bladder, coated in the same way. Generally, in wet preparations it is better to secure two or three turns of fine strong twine around the neck of the bottle over the bladders, as the latter are apt to crack and loosen themselves.

§ 4. QUICKSILVER INJECTIONS.

These constitute a beautiful and interesting department in the occupations of the practical anatomist. The parts most frequently subjected to this process are the lymphatics and lacteals. In the extremities, we introduce the pipe at the point farthest from the heart, and having injected one trunk, the pipe must be withdrawn and introduced into another, and so on till all the trunks are filled. In injecting for the lacteals, we must introduce the pipe into a lacteal trunk in the mesentery, and inject backwards; as the lacteals on the intestine itself are, for the most part, too small to admit of its introduction into them.

The liver has a great many lymphatics in its peritoneal coat; they may be injected from one of the trunks on the broad ligament. It is unnecessary to preserve the whole liver; a section of it half an inch thick, dried and hung in spirits of turpentine, answers very well.

The parotid gland injected with quicksilver from its duct, affords a fine preparation. The injection must be made before the gland is removed from the body; the blood should afterwards be soaked out, and the gland dried and hung in spirits of turpentine.

The vesiculæ seminales and the testicles of the adult, are also suitable subjects for this kind of preparation. The lactiferous ducts of the Mammæ are very favorably displayed in the same manner; they are injected separately from the nipple. Bristles should be previously introduced into each duct, and withdrawn successively as the injection advances, otherwise we may commit the mistake of injecting a duct twice. As each duct is injected, it should be secured with a ligature. A woman who has died during lactation is the best subject for it.

The hand of a thin, aged female may be readily injected, both arteries and veins, by a pipe fixed into the radial artery. After it is filled, it should be macerated in water, frequently changed, till all the blood is removed and the cuticle comes off; it should then be dried and varnished.

The veins of the kidney of a cat, afford a beautiful preparation with quicksilver.

§ 5. PREPARING BONES.

Bones are best prepared by maceration in warm weather; and a dropsical subject is much better than any other, from the marrow being less abundant and mixed with serum. The skeleton should be roughly cleaned and put into a macerating vessel, the brain being removed. The water should be changed daily as long as it is discolored by the blood. Afterwards, it should be left till putrefaction has softened and dissolved all the ligaments and soft parts. The skeleton should then be taken out and washed well in clean water with a little lye added to it. It is now to be dried and is fit for use. If the maceration be properly conducted, no bleaching is necessary; if otherwise, the process adopted in whitening linen and cotton cloths, answers well, that is, exposure to the sun, and frequently wetting with clean water or with weak chlorine water. [Dr. Ellerslie Wallace, of Jefferson College, Philadelphia, has found that macerating bones in sulphuric ether, is the best method of freeing them from grease. It leaves them, also, beautifully white; but as the ether removes a considerable portion of the animal matter, the bones are much lighter and less adapted to rough use than when they are otherwise prepared.]

A cranium from four to ten years old treated in this way, affords a fine preparation for studying its bones in a state of separation. To accomplish the latter, it is only necessary to fill its cavity with peas or beans after the maceration is over, and to immerse it in warm water. The beans in a short time begin to swell and open the sutures completely. The bones of the face must be taken asunder with the fingers.

In order to show the animal part only of bone, take a section of it and immerse it in an acid mixture composed of muriatic acid one ounce, and water one pint. In from one to four months, according to the size and solidity of the bone, the calcareous part will be taken away by the acid. The acid is to be renewed from time to time. On such a preparation one may demonstrate the pliability and the lamellated and fibrous texture of the hardest bone.

A bone, by being thrown into a strong fire, will have all its animal parts destroyed and nothing but the calcareous left. This preparation is the reverse of the last.

To demonstrate the vascularity of bone, cut off the limb of a fœtus, or of a young child, and fix a pipe into the principal artery. By filling the part with the size injection, the vessels of the bone will also be injected. Remove the flesh when it becomes cold, and macerate in water till the blood is washed out. Place the bone in the acid mixture just mentioned till the calcareous part is removed; soak it in pure water again for a day; then dry it, and finally immerse it in spirits of turpentine to make it transparent.*

* For a very valuable and instructive exposition in detail, the student is referred to a work entitled "Directions for making Anatomical Preparations;" by Usher Parsons, M. D. Professor, &c. Phila. 1831. Also "Anatomical Manipulation," &c., by Tulk and Henfrey. London, 1844.

SECTION V.

ON FUMIGATION.

The air of rooms, where dead bodies are kept, as well as the walls and furniture, become exceedingly offensive; to correct which we resort to the following mixture with great advantage. It is called the Guytonian, from its inventor.

Take Oxide of Manganese,	1 part by weight.
Common salt,	7 parts.
Water,	4 parts.
Sulphuric acid at 66°,	4 do.

The water and the acid should be previously mixed and allowed to cool. Then stir all the ingredients well together in a stone vessel.

When the room is abandoned for the night, close its doors and windows and commence this fumigation. The next morning it will be found much sweetened, and on ventilating freely, its atmosphere will lose still more of its offensiveness and be in a great measure renovated.

The fumes of this mixture are very penetrating; they give their peculiar smell to clothing for several days, and rust metallic surfaces intensely. All articles, therefore, which are not intended for such depuration, should be removed.

A milder fumigation which may be used beneficially in sick chambers, is obtained by pouring in successive portions, five parts of hydrochloric acid upon one of peroxide of manganese.

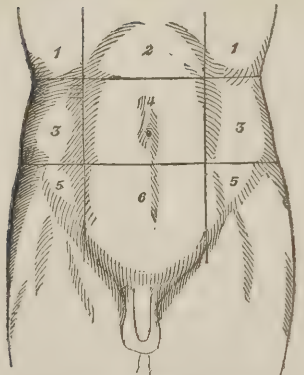
CHAPTER II.

OF THE ABDOMEN.

Before commencing the dissection of the Abdomen, it will prove useful to acquire a knowledge of its regions, or the boundaries which are established by imaginary planes passing through the subject. To form these regions, draw a line from the superior part of the Crista of one Ilium, as it appears through the skin, to the superior part of the other; then strike a perpendicular from the anterior inferior spinous process of the ileum on each side, through the cartilages of the ribs above; then draw a fourth line parallel with the first, through the points where the latter touch the cartilages of the ribs. These four lines, two vertical, and two horizontal, which represent as many planes intersecting the abdomen, form with the periphery of the abdomen, or that near the false ribs, nine regions. The one above, on the right, is the Right Hypochondriac, that in the middle, the Epigastric, and that to the left, the Left Hypochondriac. The region which has the navel in its centre is the Umbilical, and on its sides are the Right and the Left Lumbar Region. Below the umbilical is the Hypogastric or Pubic Region, and on the wings of the latter are the Right and the Left Iliac Regions.

Some anatomists call the pit around the ensiform cartilage, the Scrobiculus Cordis, and a small space just behind and elevating itself about an inch above the pubis, the Regio Pubis. The boundaries of the latter are rather undefined, but the terms are in use.

Fig. 1.



THE ABDOMINAL REGIONS.

1, 1. Hypochondriac Regions.
2. Epigastric Region.
3, 3. Lumbar Regions.
4. Umbilical Region.
5, 5. Iliac Regions.
6. Hypogastric Region.

SECTION I.

OF THE MUSCLES OF THE ABDOMEN.

To begin the dissection of the muscles of the abdomen, make a straight cut through the skin from the end of the second bone of the sternum to the symphysis pubis; and then another to cross this at its commencement above, extending the latter obliquely towards the armpit, till it reaches the side of the chest. At the termination of the second commence a third, giving it a sweep backwards, so that its direction may be parallel with the margin of the cartilages of the lower ribs, but a little distance from them. This third cut if extended to the spine, will afford an opportunity of opening the integuments still farther, when a vertical cut is made over the spinous processes down to the small end of the sacrum.

This manner of opening the integuments of the side of the belly, describes in a great measure the outline of the external oblique muscle, makes it thoroughly accessible in the progress of the dissection, and enables us to see and to display every part of it. One of the greatest obstacles to thoroughly understanding the broad muscles of the abdomen, simple as the circumstance may appear, is the imperfect manner in which the integuments are opened by dissectors; and there is no dissection more apt to be spoiled, than the one in which we are now engaged, owing to the want of a plan, founded on some previous knowledge of the parts, for commencing operations. Having thus marked off the section of the subject on which to work, begin by dissecting the skin at the upper part, so as to turn the flap downwards. But a few strokes of the knife will be made, before a thin white membrane covered with some fat will be noticed between the skin and the muscle. This membrane is called the fascia superficialis abdominis, and the upper fibres of the external oblique muscle may now be seen through it.

This FASCIA SUPERFICIALIS ABDOMINIS, consists of condensed cellular substance, with but very little fibrous matter in it, and may be considered as taking its origin on the front of the thigh, and extending in front of the abdominal muscles, as high up as the thorax; indeed, if we are disposed to trace it throughout its whole extent, there is no difficulty in following it over the front of the thorax, also to the neck, and even to the face. In ordinary cases, its desmoid or aponeurotic character is very equivocal; but where the parts about the groin have been pressed upon and thickened by the irritation of hernial protrusion, it is better developed. On the thigh it is blended with fat, and incloses between its laminæ the lymphatic glands of the groin and the external pudic vessels given off from the femoral artery immediately below Poupart's ligament. On the tendon of the external oblique it is more condensed; branches of the femoral artery are also seen in it there; one longer and larger than the others, the Arteria ad Cutem Abdominis of Haller, with its accompanying vein, winds over Poupart's ligament and runs upwards somewhat in the line of the epigastric artery, being distributed to the skin of the abdomen; the division of it will produce sufficient hemorrhage to require attention. On the symphysis pubis and about the external ring, the laminæ of the fascia superficialis are multiplied, and it has more of the character of common adipose matter, as in most cases the adeps or fat is there abundant, and forms in both sexes the protuberance called Mons Veneris or Penil. From the pubes, it may be traced as a condensed cellular membrane, along the penis to its extremity, and according to Mr. Colles, of Dublin, when matter is formed beneath it, is apt to create fistulous sores in this organ. This fascia is more loosely connected to the parts beneath it, along the anterior margin of Poupart's ligament than elsewhere, which disposes femoral hernia to observe that course in its increase. A thin lamina of this membrane may also be traced for some distance along the spermatic cord, and identified with the tunica vaginalis communis.

After studying the character of this fascia, and especially its relation to the parts about the groin, the student may proceed to remove it, though when it is once seen he will subsequently be able to make a better display of the abdominal muscles by turning off the fascia with the skin.

In dissecting the abdominal muscles, as indeed in the dissection of all other muscles, too much importance cannot be attached to cutting parallel with the fibres of the muscle, as it is absolutely essential to the beauty of the display, and indispensable to a person desirous of success in practical anatomy. A dissection done in any other manner, is unfit for study from its obscurity, and offensive to inspect, from its roughness. The sum of the directions to make a good dissector of muscles, is, to cut in the line of the fibres, close to them, and to keep the cellular tissue which unites them constantly upon the stretch.

There are five pairs of muscles to the abdomen, three broad and two narrow, to wit, the Obliquus Externus, the Obliquus Internus, the Transversalis, the Rectus, and the Pyramidalis, one of each existing on each side of the median line of the abdomen.

In the middle line of the body, the tendons of the three broad muscles on each side of the abdomen unite to form the LINEA ALBA, which extends from the sternum to the pubes. From two or three inches in the adult, on each side of the linea alba, but more distant from it above than below, is another line formed by the same tendons, which is the Linea Semilunaris. The navel, which originally was a hole for the passage of the umbilical vessels, and in the adult is commonly depressed into a pit, now appears in the linea alba as a protuberance composed of condensed cellular membrane. Just at the navel, there is a line crossing the linea alba and extending from one linea semilunaris to the other. At the lower end of the Cartilago Ensiformis, there is another, and half-way between this and the navel, a third. About half-way between the navel and the pubes is a fourth, but it is generally imperfect. These are the Lineæ Transversæ, and they are formed by tendinous matter in the substance of the Recti muscles, and connect them to their tendinous sheath in front.

1. The Musculus Obliquus Externus (or external oblique muscle of the abdomen), arises from the eight inferior ribs, by muscular and tendinous digitations attached near their anterior extremities. The first head is covered by a slip from the pectoralis major, the five upper heads are interlocked with the origins of the serratus major anticus, and the three inferior, with the latissimus dorsi. The fibres pass obliquely downwards, and terminate in a broad thin tendon. This tendon extends over the whole front of the abdomen, from the lower end of the second bone of the sternum, to the symphysis of the pubes.

It is inserted by its tendon into the whole length of the linea alba, and into the anterior half or two-thirds of the crista of the ilium, by muscular fibres posteriorly, and tendinous anteriorly. It is also to be observed, that from the anterior superior spinous process, the tendon stretches to the body and symphysis of the pubes, forming thereby the Ligament of Poupart, or the Crural Arch. As this ligament approaches the pubes from the ilium, it splits so as to leave a hole for the passage of the Spermatic Cord in the male, and of the Round Ligament of the Uterus in the female. This opening is named the External Abdominal Ring, and is one of the openings through which the bowels are sometimes protruded in the complaint called

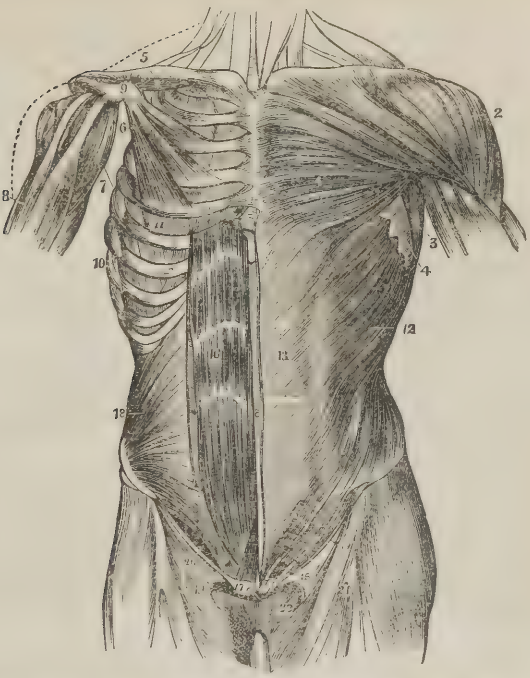
Hernia or Rupture. In dissecting at this Ring, do not work too closely between the spermatic cord and the margin of the ring; by which precaution we avoid cutting the process of the fascia superficialis that unites the two. This process arises from the margin of the ring all around, passes immediately to the spermatic cord, and is lost insensibly on the exterior surface of the cremaster muscle. A quantity of loose cellular substance, intermixed with fat, is placed between the constituent parts of the cord and the cremaster muscle. This cellular substance, the cremaster muscle, and the fascia superficialis, form, in scrotal ruptures, a thick lamina over the hernial sac, called Tunica Vaginalis Communis. The tendon forming the upper boundary of this ring, is inserted into the symphysis pubis, and into the pubes of the opposite side, by fibres which are interwoven with and decussate those of its fellow. The tendon forming the lower margin of the ring, is inserted into the spine of the pubes, and into its crista, for an inch. The portion inserted into the crista of the pubes, is Gimbernat's Ligament, which it will be readily understood, means only a part of the crural arch.

The ring in the external oblique is rather triangular than round; its base is formed by the body of the pubes, and its point is at the place where the tendon splits. The latter is kept from parting still farther, by a fasciculus of tendinous fibres which runs across it. The tendinous sides of this opening are called its Columns, and from their situation are also named the internal and external, or upper and lower columns. In the female the ring is oval, and scarcely half an inch long.

There are several small round holes in the tendon of this muscle, which afford passage to nerves and to veins. When, by the cleanness of the dissection, the tendon has its characteristic gloss and polish, they are very distinct.

Use.—This muscle compresses the viscera of the abdomen, and brings the pelvis and thorax towards each other. Latterly, the attention of anatomists has been directed to a flat band of cellulo-fibrous matter, called the Ventrier, or Belly Band, which arises from the tendon of the external oblique from the linea alba to the linea semilunaris, just above the internal abdominal ring, and

Fig. 2.



THE MUSCLES OF THE ANTERIOR ASPECT OF THE TRUNK; ON THE LEFT SIDE THE SUPERFICIAL LAYER IS SEEN, AND ON THE RIGHT THE DEEPER LAYER.

1. The Great Pectoral Muscle.
2. The Deltoid Muscle.
3. The Anterior Border of the Latissimus Muscle.
4. The Indigitations of the Great Serratus Muscle.
5. The Right Subclavian Muscle.
6. The Small Pectoral Muscle.
7. The Coraco-Brachialis Muscle.
8. The Upper Part of the Biceps Muscle, showing its two heads.
9. The Coracoid Process of the Scapula.
10. The Great Serratus Muscle of the Right Side.
11. The External Intercostal Muscle of the Fifth Intercostal Space.
12. The External Oblique Muscle.
13. Its Tendon or Aponeurosis; on the left of this number is the semi-lunar line, and on the right, the middle white line (linea alba).
14. Poupart's Ligament or the Crural Arch.

15. The External Inguinal or Abdominal Ring; the crescentic opening to the right of 15 is the saphenous opening in the Femoral Aponeurosis.
16. The Rectus Abdominis Muscle of the Right Side brought into view by the removal of the anterior segment of the sheath formed by the tendons of the Broad Muscles of the Abdomen.
17. The Pyramidal Muscle.
18. The Internal Oblique Muscle.
19. The Conjoined Tendon of the Internal Oblique and Transversalis Muscle.
20. The Arch formed by the Lower Border of the Internal Oblique and Transversalis Muscles, from beneath which the Spermatic Cord has been removed.
21. Fascia Lata Femoris.
22. Saphenous Opening.

The Crescentic Edge of the Sartorial Fascia is seen just above Fig. 22, and the Interior or Pubic Point of the Crescent is known as Hey's Ligament.

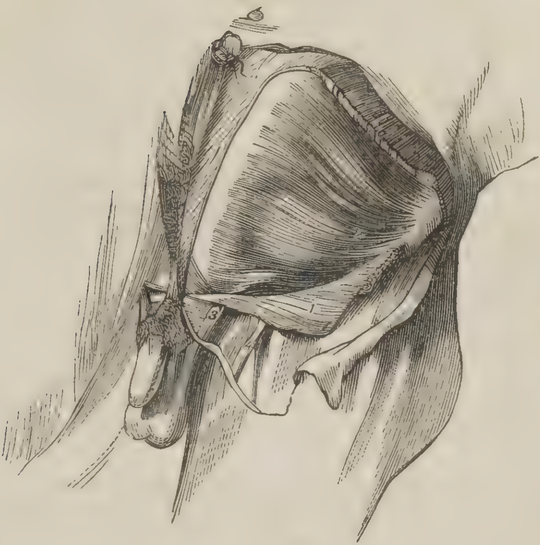
passes downwards, to be inserted into the fascia femoris over the origin of the gracilis. Its outer margin reposes in front of the spermatic cord, and leads it outwards as the band goes downwards.

The external oblique muscle should now be turned over to the other side, by dissecting it up from its origin from the ribs, and from its insertion into the crista of the ilium, by which means the student will gain a more satisfactory view of its insertion into the spine and crista of the pubes.

2. The Obliquus Internus lies beneath the last, and its fibres pass in a transverse direction to the fibres of the other. It arises tendinously, and by the fascia lumborum, from the three inferior spinous processes of the loins, and from all those of the sacrum; tendinous and fleshy, from the whole length of the crista of the ilium, and fleshy from the upper half of Poupart's ligament. Though the fibres of this muscle, in general, decussate or cross the direction of the fibres of the external oblique, all of them do not, for the lower are brought gradually to pursue the same course towards the symphysis of the pubes.

Near the Linea Semilunaris, its muscular fibres cease, and the tendon begins.

Fig. 3.



THE APONEUROSIS OF THE EXTERNAL OBLIQUE MUSCLE HAVING BEEN DIVIDED AND TURNED DOWN, THE INTERNAL OBLIQUE IS BROUGHT INTO VIEW WITH THE SPERMATIC CORD ESCAPING BENEATH ITS LOWER EDGE.

1. Aponeurosis of the External Oblique turned down.
2. Internal Oblique Muscle.
3. Spermatic Cord.
4. Saphena Vein.

It is inserted into the cartilaginous margin, formed by the six inferior ribs; that is, by fibrous, condensed, cellular membrane, into the cartilages of the seventh, eighth, and ninth ribs, and by flesh into the tenth, eleventh, and twelfth. It is inserted also into the side of the ensiform cartilage, its whole length; and into the linea alba, from the sternum to the pubes.

The tendon of the Internal Oblique muscle divides into two laminæ, in a manner which will be better explained presently, after the rectus and pyramidalis muscles have been dissected and turned down.

Its use is the same as that of the External Oblique.

The Internal Oblique should now be dissected up from its attachments to the ribs, vertebræ, ilium, and external half of Poupart's ligament, by beginning near the spine of the ilium, as it is there separated more distinctly from the muscle below, by the circumflex ilii artery, vein, and cellular substance.

3. The TRANSVERSALIS ABDOMINIS arises by the Fascia Lumborum, from the transverse processes of the last dorsal, and of the four upper lumbar vertebræ, and also by it from the posterior third of the spine of the ilium. It likewise arises fleshy from the anterior two-thirds of the spine of the ilium, and from the upper half of Poupart's ligament; tendinous and fleshy alternately, from the inferior margin of the thorax, formed by the cartilages of the six or seven inferior ribs, at their inner surfaces, where they are concerned in the origin of the diaphragm.

The fleshy part of the muscle occupies about one-third of its extent. It is inserted into the side of the ensiform cartilage, filling up the vacancy between it and the cartilages of the sixth and seventh ribs, and into the linea alba, from the extremity of the sternum to the pubes.

Its use is to compress the contents of the abdomen.

4. The RECTUS ABDOMINIS muscle may now be seen beneath the tendons of the other muscles, on each side of the linea alba. A longitudinal cut, throughout its whole length, should now be made on its inner edge through these tendons, when they may be turned over towards the linea semilunaris. The origin of the muscle will then be seen as a flat tendon of an inch or more in breadth, coming from the symphysis pubis and the upper posterior part of the body of the pubes. This muscle, in its ascent, increases gradually to the breadth of three or four inches. The tendinous intersections, which confine it to the sheath in front, are established at the places mentioned as the Linæ Transversæ, but for the most part, they do not extend through the muscle.

It is inserted fleshy into the base of the cartilago-ensiformis, and into the cartilages of the fifth, sixth, and seventh ribs.

It draws the thorax towards the abdomen.

5. The PYRAMIDALIS muscle is placed at the lower front part of the rectus, and is about three inches long. It arises somewhat thick, tendinous, and fleshy, from the upper part of the pubes, from near its spine to the symphysis, between the rectus behind and the insertion of the external oblique before, and is fixed in a sheath formed by the separation of the common tendon of the transversalis and internal oblique muscles.

It tapers to a point above, and is inserted into the linea alba and internal edge of the rectus, two-thirds of its own length, by beginning about an inch above the pubes.

It strengthens the lower part of the abdomen, but is often wanting.

The Rectus and the Pyramidalis muscles should now be detached from their origins, and turned aside. By doing so, we become sensible of an arrangement of the tendons of the broad muscles, always difficult to describe intelligibly, and generally imperfectly understood. It is this; at the linea semilunaris, the tendon of the internal oblique and that of the transversalis unite intimately, and just beyond this junction two laminæ are formed, which inclose the rectus muscle. The anterior lamina, is one-half of the tendon of the internal oblique, which, after passing half an inch or an inch, is joined to the tendon of the external oblique, and the two thus go in front of the rectus muscle, and cover it from origin to insertion. The posterior lamina, is made by the posterior half of the tendon of the internal oblique, united at the linea semilunaris to the tendon of the transversalis; they in this manner pass behind the rectus muscle, from the cartilago-ensiformis, to a line half-way between the umbilicus and the pubes. From this line downwards, all the tendons go in front of the rectus muscle. The obliquus externus tendon, may, however, be dissected from the common tendon of the others, without much difficulty, almost to the linea alba.

The term insertion, is very inadequate to express the manner in which the tendons of these broad muscles all terminate in the linea alba, from the thorax to the pelvis; but the inspection of the part, will qualify the term so as to prevent mistakes.

The CREMASTER muscle is commonly attributed exclusively to the internal oblique, and is said to be a detachment of fibres from it. But the dissection will now exhibit what is really the fact in regard to this muscle, viz., that it is also formed by fibres from the lower edge of the transversalis muscle. The history of its formation is as follows: In the descent of the testicle (which during fœtal life is within the abdomen), it has to pass beneath that edge of the transversalis, and of the internal oblique, which is extended from the upper part of Poupart's ligament to the spine and crista of the pubes; but as it descends, it comes in contact with a fasciculus of these fibres, and takes it along with it into the scrotum, or bag, which is below the penis. The fasciculus of these muscles constitutes the Cremaster muscle, the fibres of which in adult life and in a strong muscular subject, are seen descending on the outside of the spermatic cord, and spreading over the anterior part of the tunica vaginalis in arches, with their convexities downwards; then rising on the inner side of the cord they are inserted into the spine of the pubes.*

It draws up the testicle.

As the student becomes acquainted with the dissection of this part by operating on a number of subjects, he will be sensible that there are differences in individuals, which render the established descriptions occasionally

* Mr. J. Cloquet, of Paris, has given this explanation of the formation of the cremaster, and it sometimes is manifest in the adult; it is, however, not in accord with Mr. Jno. Hunter's account of it, neither does it correspond with what I have witnessed in the male buffalo, in a specimen given to me by the late Dr. Harlan, of Philadelphia. Mr. Hunter has seen the muscle running up the testis, while the latter was still in the loins.

unsuitable. One of the most usual of these is the deficiency of the transversalis muscle in that part, the origin of which is usually attributed to the upper half of Poupart's ligament. In this case, the internal oblique has increased thickness, and, of course, the cremaster will be exclusively derived from it. In other instances, the two muscles are so much blended that they cannot be satisfactorily separated from each other.

The Transversalis, and the Internal Oblique, perform so important a part in the doctrines of Hernia, that one desirous of understanding them well, should, at this time, again pay attention to the mode of their insertion into the pubes. It will thus be seen that they form below, a common tendon, which is inserted, for an inch, into the crista of the pubes behind Gimbernat's ligament, into its spine, and into that part of its body which is behind the external abdominal ring; and that just within and above their insertion, the same common tendon splits into two laminæ, one going before, the other behind the pyramidalis muscle, thus forming a sheath for it as just stated.

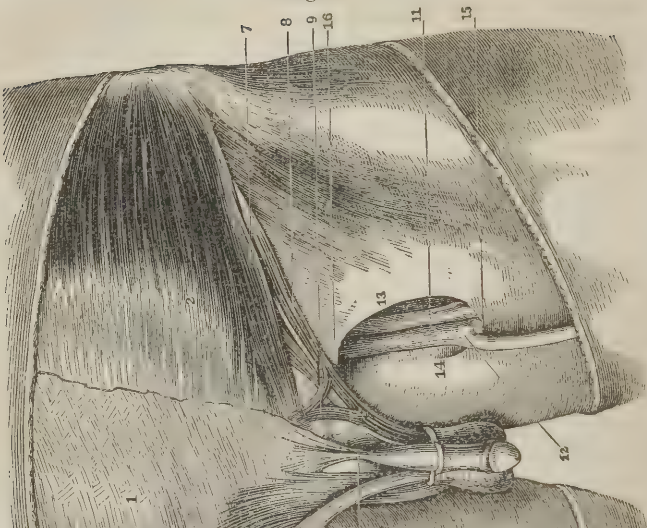
In examining the origins of the RECTI muscles from behind (the peritoneum being first stripped off), it will be seen that a protrusion of any intestine between them, is prevented by the internal edge of the one tendon overlapping the internal edge of the other; and by a triangular ligament, called by Mr. Breschet, its discoverer, the Superior Pubic Ligament.

SECTION II.

OF THE PARTS CONCERNED IN INGUINAL HERNIA.

As it is better for the student to postpone the subject of Hernia, until he has become acquainted with the abdominal muscles and the contents of the abdomen, he may, after paying attention to what has just been said concerning them, in the dissection of one side of the subject now undertake the special study of *Inguinal* Hernia on the opposite side by proceeding in the following manner:—

Fig. 4.



Dissection of some of the Parts concerned in Femoral and Inguinal Hernia.

1. Tendon of the External Oblique Muscle.
2. Tendon of the Internal Oblique, the first-named muscle being dissected off.
3. Cribriform Fascia.
4. Vena Saphena.
5. External Abdominal Ring and Spermatic Cord.
6. Poupart's Ligament.

7. Abdominal Canal laid open.
8. Cremaster Muscle, covering the cord from Poupart's Ligament.
9. Additional Slips to the Cremaster, arising from the Spine of the Pubis.
10. Suspensory Ligament of the Penis.
11. Femoral Vessels.
12. Point at which the Saphenous Vein joins the Femoral.
13. Sartorial Fascia.
14. Pectineal Fascia.
15. Lower Horn of the Crescent formed by the Sartorial Fascia.
16. Upper Horn of the Crescent, the extreme point of which is inserted into the spine of the pubis, forming *Hey's ligament.*

Make an incision on this side of the linea alba, through the skin and fascia superficialis, from the umbilicus to the anterior superior spinous process of the ileum, and turning this flap downwards over the thigh, cut through the tendon of the external oblique, on a line, which, commencing at the Linea Semilunaris, a quarter of an inch above the upper margin of the external ring, shall end a quarter of an inch above the anterior superior spinous process of the ilium. This incision should be regularly curved, its convexity being downwards, and almost touching the middle of Poupart's ligament. The tendon of the external oblique, bordering on the incision, being now turned upwards and downwards, a good view will be given of the inferior part of the internal oblique muscle, where it arises from the iliac or upper half of Poupart's ligament, and is inserted into the body and crista of the pubes, just behind the external abdominal ring. The origin of the cremaster muscle will also be well seen, and the constituent parts of the cord, as they are about to enter into the external ring.

Separate the inferior margin of the internal oblique from Poupart's ligament, and turn it upwards, beginning near the anterior superior spinous process of the ilium, where the distinction between the internal oblique and the transversalis is better marked. The lower part of the transversalis will then be exhibited, as placed behind the internal oblique, and with the same origin from Poupart's ligament and the same insertion into the pubes. The raising of the internal oblique, will also bring into view more of the spermatic cord, near the external ring.

The Transversalis Muscle should then be detached from Poupart's ligament, and raised up. This gives a complete view of the spermatic cord, consisting here of its vessels, nerves, and excretory duct, united by cellular membrane. The upper part of the visible portion of the cord, is about half-way between the anterior superior spinous process of the ilium and the symphysis of the pubes, and penetrates the fascia transversalis. The fascia transversalis is placed immediately behind the transversalis muscle, between it and the peritoneum. An opening or a prolongation of a portion of the fascia transversalis, which permits the cord in the male, or the round ligament of the uterus in women, to pass, is called the Internal Abdominal Ring, in order to distinguish it from the opening in the tendon of the external oblique, called the External Ring. It should, however, be understood that the internal abdominal Ring only exists *as a ring* in subjects who have hernia. In the normal state, the fascia transversalis extends on to the cord, and may be seen as a funnel-shaped process (infundubar fascia of some surgeons), by drawing the cord gently downwards. When pressed on by Hernia, this process is absorbed, and its base thickened on the edges so as to form a ring. This internal ring is rather nearer to the symphysis pubis than to the spinous process of the ilium. It will now be seen that the space between the internal ring and the external ring is about eighteen lines in the adult, and that it is very properly called the Abdominal, Inguinal, or Spermatic Canal, as giving passage to the spermatic cord. The anterior side of the canal is formed by the tendon of the external oblique; the inferior part in the erect posture is formed by Gimbernat's ligament; the posterior parietes are formed by the fascia transversalis, and above, the canal is overhung by the internal oblique and transversalis muscles. It should be observed, that the spermatic cord, after escaping through the fascia transversalis, does not cross directly the inferior edge of the internal oblique and transversalis at right angles, but passes beneath them very obliquely, its inclination being towards the pubes, so that the spermatic cord can only be considered as disengaged from the inferior edge of these muscles, about the middle of the abdominal canal.

At the External Ring, the posterior or ventral face of the fascia transversalis is not in contact with the cord, but that part of the tendon of the internal oblique and transversalis which is inserted into the crista and body of the pubes, and forms a sheath for the pyramidalis muscle, is placed between them, and secures this opening.

The incisions which were originally made only through the integuments, fascia superficialis and external oblique tendon, should now be carried through the other muscles of the abdomen into its cavity, and the flap thus constituted, be turned down in order to get a view of its posterior or ventral face. This surface covered by peritoneum, is divided in the iliac region near the middle of Poupart's ligament, into two superficial fossæ, by a narrow, falciform process of the peritoneum. The process arises from the side of the bladder, and extends upwards and inwards towards the umbilicus, stopping about two inches short of the umbilicus. It is broader below than it is above, and its loose edge is turned towards the abdomen. By stripping down the peritoneum, we shall see that this falciform process is simply a duplicature of it, occasioned by the fibrous cord, the umbilical ligament of the bladder, which once was the umbilical artery of the fœtus. This cord passes near the pubic margin of the internal abdominal ring. Replacing the peritoneum, we become convinced that the bottom of the superficial fossa on the outer or iliac side of the falciform process, corresponds with the internal abdominal ring, a little pouch of peritoneum frequently entering the latter. The fossa on the inner or pubic side of the falciform process, is just behind the external ring, but separated from it by the fascia transversalis, and by the tendon of the lower parts of the internal oblique, and the transversalis muscles where they are inserted into the pubes, and form the sheath of the pyramidalis. The two fossæ indicate the points where inguinal herniæ commence, the proper inguinal protrusion beginning generally in the external fossa, and the ventro-inguinal in the internal fossa. Such, at least, is the opinion of some writers, though it is not held by others, as they believe (of which I have had evidence) that all cases of hernia at the groin, both inguinal and ventro-inguinal, begin in the external fossa. The German anatomists are decidedly of this opinion. We should here notice the looseness of the attachment of the peritoneum by cellular substance to the parietes of the abdomen, and consequently the little resistance which it, unsupported, can afford against intestinal protrusion.

The view of the FASCIA TRANSVERSALIS from behind, is extremely satisfactory. For a proper knowledge of this membrane, the profession is indebted to the labors of Sir Astley Cooper, and much of the zeal with which the anatomy of hernia has been investigated in latter years, is attributable to him. The fascia transversalis is most generally a thin tendinous membrane; occasionally, it more closely resembles condensed cellular membrane. It arises from the internal or abdominal edge of Poupart's ligament, and from the crista of the pubes just behind the insertion of the tendon of the internal oblique and transversalis muscles, and is extended upwards on the posterior face of the transversalis muscle to the thorax. At its origin, it is attached to the inferior edge of the transversalis and internal oblique, particularly that part of their edge between the internal ring and the pubes. It is also attached to the exterior margin of the rectus abdominis, where the muscle is destitute of its sheath behind, and it is then continued on to the linea alba. The internal abdominal ring, or opening in this fascia, marks it out in some measure as consisting of two portions, that on the iliac side of the ring is not so thick as the other or the one on its pubic side, and both portions are much more tendinous near the crural arch than they are higher up. Were it not for the important influence of the fascia superficialis and the fascia transversalis, upon hernia, and the consequent necessity of a minute knowledge of them, the description might be much curtailed, in considering them in their proper light, to wit, as the sheaths of muscles; for it is now sufficiently apparent that the first is contiguous to the external oblique, and the second to the transversalis muscle.

Removing the peritoneum from the iliacus internus muscle, we see the spermatic vessels, descending from the loins to the internal ring, where they are joined by the vas deferens coming from the pelvis. As they engage under the edge of the internal oblique muscle, after penetrating the ring, the cremaster muscle is detached to spread itself over them. The spermatic cord, thus constructed, passes through the abdominal canal in the manner mentioned, obliquely downwards and inwards; emerging from the external ring, it descends vertically, lying rather upon the outer column of the ring, than upon its base.

On the posterior face of the fascia transversalis, between it and the peritoneum, is the Epigastric Artery. The epigastric arises from the external iliac as the latter is about to go under Poupart's ligament; it ascends inwardly along the internal margin of the internal abdominal ring, to the exterior margin of the rectus abdominis muscle, which it reaches after a course of two and a half or three inches. The spermatic cord, in getting from the abdomen to the abdominal canal, therefore winds in part around the epigastric artery, in the first of its course being at the iliac edge of the artery, and then in front of it. Two epigastric veins attend the artery, one on each side, which end by a common trunk in the external iliac vein.

From what has been said, it will now be more fully understood that this structure admits of two places of protrusion. In the first, the intestine pushes the peritoneum through the internal ring and along the inguinal or abdominal canal into the groin, the constituent parts of the cord being behind the sac, and separated by it from the cremaster muscle, which, in this case, forms one of the envelops of the sac. In the second, from weakness of the fascia transversalis and the pubic insertion of the internal oblique and transversalis muscles, a protrusion immediately behind the external ring may occur, in which the whole cord, including the cremaster, will be at the outer margin of the sac. In the first species, or the Inguinal Hernia, the epigastric artery is at the pubic or inner side of the neck of the sac; but in the second, or the Ventro-Inguinal, it is at the outer or iliac side.

The anatomical arrangement of the parts concerned in inguinal hernia in the female is the same as in the male, except that the round ligament of the uterus supplies the place of the spermatic cord, and there is no cremaster muscle. (For an account of Femoral Hernia, see Lower Extremities.)

SECTION III.

OF THE CONTENTS OF THE ABDOMEN.

For the ordinary *post-mortem* examination, a crucial incision through the parietes of the Abdomen, from the sternum to the pubes on the left of the navel, and from one side to the other on a line with the umbilicus, but a little below it, answers very well, the flaps thus made being turned aside and kept down, so as to display the viscera of the abdomen. But in the dissection just made they are, if possible, more fully displayed on everting the flaps, and should first be studied in their natural positions.

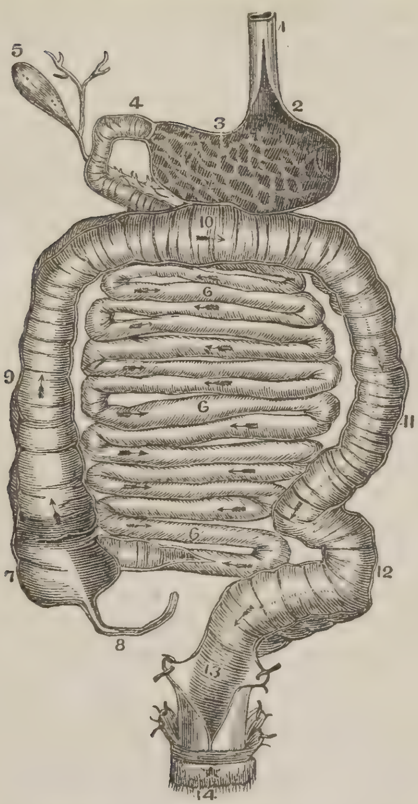
1. The Liver is in the Right Hypochondriac region; it occupies nearly the whole of it, the upper part of the Epigastric, and the right superior part of the left Hypochondriac. The fundus of the gall-bladder projects from its right inferior surface, beyond its anterior edge.

2. The Stomach, when not much distended, is confined to the lower half of the Epigastric region, and to the right inferior part of the left Hypochondriac.

3. The Spleen, if not large, recedes so much into the back part of the left Hypochondriac, that to be seen it must be drawn out.

4. The small Intestines lie in the Umbilical, Hypogastric, part of the Iliac regions, and also in the Pelvis, when the viscera of the latter are not distended.

Fig. 5.



THE DIGESTIVE TUBE, FROM THE ŒSOPHAGUS TO THE ANUS.

1. Œsophagus, which is laid open at 2, to show its termination in the cardiac orifice of the stomach.
3. Interior of the Stomach with its rugæ.
4. Duodenum, commencing at the Pylorus.
5. Gall-bladder with the Cystic Duct, which last passes downwards to open into the duodenum.

6, 6, 6. Small Intestine, terminating in 7, the Cæcum.

8. Appendicula Vermiformis.
9. Right ascending Colon.
10. Transverse Arch of the Colon.
11. Left descending Colon.
12. Sigmoid Flexure.
13. Rectum.
14. Anus.

5. The Colon begins in the right Iliac region, passes up into the right Lumbar and Hypochondriac and through the upper part of the Umbilical, or the lower of the Epigastric, according to the distension of the stomach; it then gets to the left Hypochondriac, being commonly higher up in it than in the right Hypochondriac; thence it passes into the left Lumbar and Iliac, forms its sigmoid flexure, and dips into the pelvis, where it is continuous with the rectum.

6. The Omentum Majus is in front of the small intestines, and most frequently found gathered up in the Umbilical region. If it be not diseased, it may be drawn downwards to the pelvis, and spread out so as to conceal all the front of the intestines.

7. The Pancreas is at the back of the Epigastric region, behind the stomach; it lies horizontally, and extends from the right of the spine into the left Hypochondriac region. It cannot be seen without cutting through the omentum majus, and turning the stomach upwards.

8. The Kidneys and Capsulæ Renales are in the Lumbar regions, at their back parts. They should not be sought for at this stage of the dissection.

Although this is the natural position of the viscera when a person is lying down, it is useful to know that it is influenced much by any position of the body, and that in what is said of the occupancy of the regions it is understood that the subject is on its back. When one stands upright, the lumbar vertebræ are more convex in front, and the abdomen more protuberant below. The pelvis is so adjusted that the acetabula are nearly in a vertical line with the spine, which gives great obliquity to the superior strait, mounts the sacrum up on high, and brings the bodies and rami of the pubes not many degrees from the horizontal line. Most of the viscera descend, but more particularly the liver, which being no longer sustained by the false ribs, and being influenced by its heavy inert mass, may, in many cases, be felt externally along the right inferior margin of the thorax. The descent of the liver will be according to the degree of vacuity of the stomach, intestines, and bladder.

It is said by Winslow, that the uneasiness, pain, and faintness we feel in a vacuity of the stomach, &c., from the want of food, arise from the liver drawing the diaphragm downwards. Portal informs us, that, in order to ascertain the descent of the liver in the erect posture, he has often thrust poniards below the false ribs of dead bodies, and that he has invariably found the wounds much higher up, than when they were inflicted in the horizontal posture.

It should be well recollected that the abdominal cavity is always full, there being no unoccupied space in it; hence, whenever any viscus has an inordinate growth, or a tumour forms on it, or an effusion occurs in the peritoneal cavity, the other viscera are encroached upon. In a treatment for sickness, when the stomach and bowels have been evacuated by low diet and purging, air supplies the place of more solid matter, and keeps them distended. It is indeed exceedingly rare to find the small intestines contracted; in the large, it is more common.

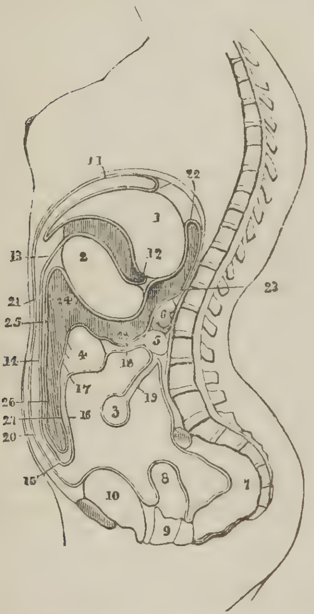
Having become generally informed on the viscera of the abdomen, by repeated handling, the student should, in the next place, proceed to an examination of their forms and structure.

§ 1. THE PERITONEUM.

The Peritoneum is a thin, delicate, semitransparent membrane, very extensible, and spread out so as to line the cavity of the abdomen, and give an external covering to the greater number of its viscera. In man, it is a complete sac, having no hole in it; but in woman, its cavity communicates externally through the Fallopian tubes. It has a double use; in consequence of covering the viscera, it is so reflected from them to the sides of the abdomen, that its processes keep the viscera in their proper places, and therefore answer as ligaments. Again, its internal surface being smooth, highly polished, and continually lubricated by a thin albuminous fluid, corresponding with the synovial fluid of the joints, the motions which the viscera have upon each other in exercise, and in the peristaltic movements of the bowels, are much facilitated.

Fig. 6.

Reflections of the Peritoneum.



1. Liver.
2. Stomach.
3. Small Intestine.
4. Arch of the Colon.
5. Duodenum.
6. Pancreas.
7. Rectum.
8. Uterus.
9. Vagina.
10. Bladder.
11. Peritoneum reflected a little farther back, from the Diaphragm to the Liver, which last it covers above in front and below and forms the Anterior Lamina of the Lesser Omentum,
12. It then covers the anterior face of the stomach, and forms at 13 and 14 the anterior layer of the omentum majus; at
15. It is reflected upwards to form at 16 the posterior layer of that omentum; at
17. It embraces the colon on its posterior surface and forms the posterior lamina of the mesocolon at 18; it then passes in front of the duodenum, 5, and descends

to embrace the small intestine, 3, whence it is reflected upwards so as to give the posterior lamina to the mesentery, 19; it next passes down the posterior parietes of the abdomen, covers the rectum, 7, in front—the uterus, 8, the bladder, 10, and thence ascends to constitute the abdominal peritoneum, 20 and 21, lines the diaphragm, and terminates above in the coronary ligament of the liver at 22. If we now trace the peritoneum from the posterior margin of that ligament, 22, we find it coating the posterior face of the stomach, 1, and then separating from that organ to form the posterior lamina of the lesser omentum at 23; it next covers the posterior face of the stomach, 24, and is thence reflected downwards to constitute the posterior layer of the anterior fold of the greater omentum, 25, 26; after which it turns upwards and forms at 27 the anterior layer of the posterior fold of the greater omentum; it then invests the front surface of the colon, 4, and forms at 28 the anterior face of the mesocolon; it thence passes upwards in front of the pancreas, 6, and terminates where we began, at the posterior margin of the coronary ligament of the liver.

The manner in which a double nightcap is applied to the head, will afford the easiest conception of the reflections of the peritoneum. If there were only one viscus in the belly, and that of a somewhat regular outline, as the spleen, the comparison would be rigid, and perfectly appreciable. One part of the cap is close to the head, and compares with the peritoneal coat of the spleen; the other is loose, and is equivalent to the peritoneum, where it is in contact with the parietes of the belly. It is also evident from this, that none of the viscera can be said to be within the cavity of the peritoneum; that they are all on its outside; and that a viscus in getting a coat from the peritoneum, merely makes a protrusion into its cavity. Starting with this most simple proposition, it is easy to conceive of a second, a third body, and so on, deriving an external coat from a protrusion into the same sac. Admitting these bodies to be spheres, the proposition is immediately intelligible; and as a last step from it, the idea is not rendered much more complex by substituting any bodies, even the most irregular in form, for these spheres. Such, then, is the fact in regard to the stomach, intestines, &c.; they all, with exceptions to be stated, derive an external coat from the peritoneum.

The reflections of peritoneum forming the ligaments of the liver, will be best described in connection with that viscus. Its reflections over the viscera of the pelvis, will be described with them; we will merely say, for the present, that it covers the upper and back part of the urinary bladder, and in man is reflected from it to the rectum.

The reflections for immediate study, are the Omenta, Fatty Appendages of the Colon, the Mesentery, and the Mesocolon.

There are four OMENTA. Omentum Minus or Hepatico-Gastricum, Omentum Majus or Gastro-Colicum, Omentum Gastro-Splenicum, and Omentum Colicum.

1. The OMENTUM MINUS, or HEPATICO-GASTRICUM, extends as its name imports between the liver and the stomach. Beginning at the transverse fissure of the liver, it passes from the lobulus Spigelii, at the posterior half of the umbilical fissure and from the tendinous centre of

the diaphragm, to the lesser curvature of the stomach, in all the space from the cardiac to the pyloric orifice and the duodenum. It is composed of two laminæ, which, near the stomach, are separated by the coronary vessels. It has always but an inconsiderable quantity of fat in it. Its right margin is commonly called the Capsule of Glisson, and contains the hepatic vessels.

2. The Omentum Majus, or Gastro-Colicum, is an irregular quadrilateral membrane, having its base upwards. The latter is fixed anteriorly to the greater curvature of the stomach, and posteriorly to the transverse arch of the colon. It hangs loose in its inferior part, and is sometimes found spread over the intestines as low as the pelvis; it is, therefore, not improperly compared to an apron. On its right side, it is continued into the omentum colicum, and on the left into the gastro-splenicum. It consists of two laminæ, the anterior of which is fixed to the stomach, the posterior to the colon. Each of these laminæ, again, is composed of two, so that it may be compared to two bags, one within the other, connected at their upper or open end to the stomach and colon. The internal and external bags are very separable above, but below they are closely united. In corpulent subjects, a great deal of fat is found in this membrane.

By searching for the neck of the gall-bladder, we shall find near it, under the capsule of Glisson, the Foramen of Winslow, an opening which conducts into the sac or cavity of the omentum majus. It is large enough to admit easily two fingers. By detaching the omentum majus from the stomach, and turning it down, we shall see the nature of its cavity, its extent, and all the parts constituting its parietes. This cavity is bounded above by the omentum minus and stomach; in front, by the two laminæ sent from the stomach; behind and below, by these laminæ being reflected upwards and joining the colon, and posteriorly and above, by the upper lamina of the mesocolon, which is extended to the Lobulus Spigelii. A little reflection will show that I have described an uninterrupted cavity, beginning at the lobulus spigelii by the omentum minus, and terminating with the lobulus spigelii by the upper lamina of the mesocolon. It is acknowledged on all sides to be one of the most obscure propositions in descriptive anatomy, even when the subject is before a young student. It is a point well worth mastering, as, when this is accomplished, all other difficulties, in studying the reflections of the peritoneum, are much diminished.

3. The Omentum Colicum is a prolongation of the omentum majus, from the internal side of the right ascending colon, and from the adjacent part of the transverse. It is filled with fat, from the same causes as the preceding, but consists of only two single laminæ.

4. The Omentum Gastro-Splenicum is that process of peritoneum which extends from the large extremity of the stomach to the spleen; it may be considered as the left flank or prolongation of the omentum majus, and incloses in its duplicature the arteries and veins called Vasa Brevia.

5. The Appendiculæ Epiploicæ are little processes of peritoneum, filled with fat, appended at irregular intervals to the anterior sides of the cæcum, colon, and the upper part of the rectum.

The Mesentery is a process of peritoneum which is extended obliquely across the spine, from a line parallel with the second lumbar vertebra, to the right iliac fossa. This part, called its root in the adult, is about six inches in length, and flat; but the inferior edge, which is loose and pendulous, having the intestines connected with it, has its circumference increased to many feet, being the whole length of the small intestines, with the exception of the duodenum. The mesentery attaches the left extremity of the small intestines to the spine. It consists of two laminæ of peritoneum, separated by the mesenteric arteries and veins, the lacteal glands and vessels, and the nerves derived from the solar plexus. There is also some fat between them.

Fig. 7.

The Mesentery.

a, a. The Mesentery suspended.
b, b, b. The Small Intestine.
c. Mesenteric Glands.

The Mesocolon fixes the large intestine to the back of the abdomen. The posterior part of the cæcum is in contact with the iliac fascia, and is tied down to it. The colon, in the right and left lumbar regions, is also for the most part immovably fixed, the mesocolon being there of very little length; but the transverse mesocolon is long, and forms a complete and movable partition between the upper and the lower parts of the abdomen, which permits the colon to ascend and descend according to the distension of the small bowels and stomach. In the left iliac region, the mesocolon is elongated so much as to allow very free motion to the sigmoid flexure of the gut, and is continued into the mesorectum.

§ 2. OF THE VENTRICULUS, OR STOMACH.

The Stomach is a conoidal sac, curved considerably upwards. As was stated, it is in the epigastric region, in contact above with the diaphragm, with the left lobe of the liver and the lobulus spigelii; on the left, with the spleen; behind, with the pancreas; and below, with the colon and mesocolon. The stomach has a very great obliquity in its situation, the right extremity being much lower down than the left.

The exterior of the stomach presents two faces, two orifices, two curvatures, and two extremities.

When the stomach is nearly empty, it becomes somewhat flattened, and then exhibits the Anterior and the Posterior face; in a state of distension, the first looks obliquely upwards, and the latter obliquely downwards. The angle, formed with the œsophagus, is increased according to the degree of distension.

The orifices are named Pyloric and Cardiac. The Pyloric, viewed externally, presents nothing remarkable, but seems to be a continuation of the right extremity of the stomach into the duodenum. The Cardiac, formed by the junction of the œsophagus with it, is at the upper edge of the stomach, and some distance from the extreme left.

The curvatures are the Great and Small. The first includes the great extremity and the inferior edge of the stomach to the pylorus; the small is the upper margin between the orifices.

The Tuber or great extremity of the stomach, is the part to the left of the vertical plane, passing through the cardiac orifice; it is smaller in proportion in children than in adults.

The stomach is formed by four coats or laminæ, the Peritoneal, Muscular, Cellular, and Mucous. The external is Peritoneal, and derived from the separation of the two laminæ of the omentum minus. The second is Muscular, its thickness is inconsiderable, and the fibres which compose it are remarkably pale; they are best seen near the cardia and at the pylorus. At the latter, they are collected into a ring of considerable thickness, which, making a marked prominence internally, helps to constitute the valve of the pylorus. The muscular fibres go in three directions. The first, being longitudinal, are continued from similar ones of the œsophagus and extend to the pyloric orifice. The principal part of them is collected into two bands, the thicker of which passes along the lesser curvature, and the thinner along the greater. The second set of muscular fibres surrounds the stomach by segments of circles, none of them going completely around. It is this set, in an especial manner, which assists in forming the pyloric orifice. The third and most profound set of muscular fibres, sometimes spoken of as the muscle of Gavard, is oblique, and forms two large bands. One is extended from the left side of the cardia over the anterior and posterior faces of the stomach; and the other is prolonged from the right side of the same orifice over the great extremity also before and behind, where it supplies the scarcity of transverse or circular fibres.

The third coat of the stomach, consists of a very dense compact short cellular membrane, which unites the muscular and internal coat, and conducts the vessels and nerves to the latter.

The fourth, or Internal Coat of the stomach, called also the Mucous or Villous, is of a light red color, about a line in thickness, and can be easily raised up by dissection. It is like velvet, and thrown into very irregular folds, according to the degree of contraction of the stomach. At the pyloric orifice, it forms a circular fold constituting the pyloric valve, and having a round hole in the centre. At the base of this valve, the muscular fibres make a distinct ring. The stomach is supplied with blood, by the Gastric, Right and Left Gastro-Epiploic Arteries, and by the Vasa Brevia. The veins follow the course of the arteries, and terminate, directly or indirectly, in the Vena Portarum.

§ 3. OF THE INTESTINAL CANAL.

This Canal is from thirty to thirty-five feet long in the human subject, and extends from the Pylorus to the Anus.

It consists of two portions, which, owing to a well-marked difference in magnitude, is divided by anatomists into the Small and Large intestines; the former, forming four-fifths of the whole, extends from the stomach to the ileo-colic valve, the latter from this valve to the anus. This canal, like the stomach, consists of four coats, peritoneal, muscular, cellular, and mucous.

The SMALL INTESTINE, or INTESTINUM TENUE, although an uninterrupted tube, is divided somewhat artificially, for the sake of description, into three parts, Duodenum, Jejunum, and Ileum.

The DUODENUM, named from its length, which has been fixed at twelve fingers' breadth, is nearest the stomach, and the commencement of the canal. It is also called Ventriculus Succenturiatus. Beginning at the pylorus, it passes upwards, and to the right side, till it reaches the neck of the gall-bladder; it then forms a right angle, and passes downwards before the right kidney, to the third lumbar vertebra, being there placed behind the superior lamina of the transverse Mesocolon. Here it forms a round elbow, and crosses the spine obliquely upwards, under the junction of the mesentery and mesocolon, and makes its appearance to the left of the second lumbar vertebra, where it is continued into the mesenteric portion of intestine.

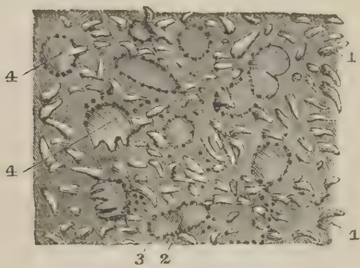
The head of the Pancreas lies in the bend of the duodenum, and fixes it firmly just there. The first part, where it emanates from the pylorus, is movable, and covered with peritoneum; the second and third portions are between the laminæ of the mesocolon, but have no peritoneal coat; and the termination is both movable, and has a peritoneal coat from being at the commencement of the mesentery. The partial deficiency of peritoneal coat, is said to be the cause why the duodenum is susceptible of an enlargement, in some cases, but little inferior to the stomach.

The muscular coat of this intestine consists of two planes of fibres, the external one longitudinal, the other circular and much the most numerous. Beneath is the cellular coat, connecting it with the mucous or villous coat. This internal coat is reddish, tinged with bile, and occupied by a great number of rugæ or folds. They are transverse and oblique, very near each other, about three lines broad, and as prominent in the distended as the undistended gut; these constitute the Valvulæ Conniventes. Many mucous follicles exist in this intestine, and mucous glands, called Glands of Brunner; the latter are particularly accumulated about the pyloric orifice. It is in the posterior part, about four inches from the stomach, that the orifices of the pancreatic and hepatic ducts are found.

The Inferior, or Mesenteric portion of the Intestinum Tenue, has the same coats with the preceding. In the upper two-fifths, called JEJUNUM, by Galen, from a supposition that it was most frequently found empty, the valvulæ conniventes are numerous, and arranged transversely; but in the lower three-fifths, called ILEUM, they gradually diminish, and near its termination, cease entirely. There is a gradual diminution of the diameter of this intestine from above downwards. From the length of the mesentery, great latitude of motion is allowed to it. It presents a very irregular and confusing appearance at first, but one soon becomes accustomed to its course and convolutions; and then its commencement and termination are as readily found as those of any other organ. It is probable that, in the distensions of this bowel, the peritoneal coat does not stretch much, as the laminæ of mesentery are loosely applied against each other where they join the intestine, and are separated in its distensions, as far as the first row of the mesenteric arches of blood-vessels. Cases are reported, in which it has had appendiculæ epiploicæ and cul-de-sacs projecting from its sides. I have never seen the former, but of the latter, a specimen was presented to me some years ago, taken from a child, by the late Dr. EDWARD BARTON; and another specimen now belongs to the Wistar [and Horner] Museum, obtained in the dissecting rooms.

The mucous or internal coat of the Intestinum Tenue, differs from that of the stomach, in resembling more the downy cuticle of an unripe peach. The little projections from it, are called Villi. It abounds with mucous follicles and glands; the latter consist in those of Brunner, which are insulated from each other and may be seen at intervals along the whole intestine; and in those of Peyer, which make about thirty patches of an elliptical shape

Fig. 8.



GLANDS OF PEYER.

and of various sizes, towards the lower end of the Ileum. The small intestine is supplied with blood from the superior mesenteric artery. Its nerves come from the Sympathetic.

The course of the large Intestine or the Intestinum Crassum, has already been explained. It is more obviously a conical tube than the small intestine, being very large at its commencement when inflated, and diminishing much to the lower end of the sigmoid flexure. Anatomists call its commencement, or that part below the ileo-colic valve, CÆCUM, or Caput Coli; and the remaining portion, which is by far the longest, the COLON, until it reaches the pelvis, when it becomes RECTUM.

The CÆCUM, or Caput Coli, is about two inches in length, and is fixed to the iliac fascia by peritoneum and loose cellular membrane. At its inferior extremity, towards the left, is the Appendicula Vermiformis, a blind cavity of four coats, about four inches long, and of the size of a turkey quill, inclosed in a duplicature of peritoneum. It floats loose, and occasionally becomes a cause of mischief, by getting around the ilium, and inflaming, by which it adheres, and produces, in some measure, strangulation. The colon makes a large sweep around the

Fig. 9.

THE SEVERAL PARTS OF THE LARGE INTESTINE.

a. The Cæcum.
b. Right or Ascending Colon.
c. Transverse Colon, or Arch of the Colon.
d. Left or Descending Colon.
e, e. Sigmoid Flexure of the Colon.
f. Rectum.
g. Mesocolon.
h. The end of the Ileum, or its termination at the Ileo-cæcal Valve.
i. Appendicula Vermiformis.
k. Pouch of the Rectum.
l. Anus.
m. Appendices Epiploicæ.

abdomen, and in passing under the gall-bladder, touches it, and thus becomes tinged with bile after death. In its transverse course, we frequently find it passing through the umbilical region.

The coats of the Intestinum Crassum correspond in number with those of the small intestine; but there are some differences in structure. The longitudinal muscular fibres are much more conspicuous; they are collected into three bands, which commence at the head of the colon, and extend to the upper part of the rectum; one is superior, another inferior, and a third anterior. They are equidistant from each other. These longitudinal bands produce the cells of the colon, in consequence of being shorter than the other coats of the gut, and puckering them up by drawing its extremities nearer together. The cells are separated laterally, by partitions or buttresses, formed of a doubling of all the coats of the intestine; whereas, in the small intestine, the valvulæ conniventes or doublings belong exclusively to the mucous membrane. These cells are not so numerous or well formed in the sigmoid flexure and thereabouts; the channel is therefore more open and unobstructed. By dividing these longitudinal bands, the cells are removed, and the intestine elongated considerably.

The Ileo-Colic Valve, or valve of Bauhin, or Tulpius, is a great curiosity in the anatomical structure of this gut. The ileum runs into the left side of the colon, and continues its cellular and mucous coat into the corresponding coats of the colon, the muscular coat of the latter being simply parted. To prevent the farther separation of the muscular fibres, a little ligamentous arrangement, called the Retinaculum of Bauhin or Morgagni, prevails at each end. When viewed from within the colon, the opening appears as a transverse, or very narrow elliptical slit, established by two lips, the superior being broader than the inferior. They meet like the gates of the common ship-dock or hydraulic lock; and from being placed transversely, in regard to the cavity of the intestine, every distension which the latter may suffer from the accumulation of feces, has a tendency to

Fig. 10.

ILEO-CÆCAL VALVE.

a. The Terminal Part of the Ileum.
b. The Ileo-Cæcal Valve.
c. The Cæcum.
d. The Appendicula Vermiformis.
e. The Commencement of the Colon.

force this valve, and will, by stretching its extremities, make the lips tighter and more resisting.

The internal coat of the large intestine differs very materially from that of the small. It has no doublings or folds exclusively in it, like the valvulæ conniventes of the small intestines, and few or no villi. Near its commencement, it preserves the fungous appearance of the stomach, but about the sigmoid flexure, it is a plain smooth surface. A great many mucous follicles and mucous glands are in it. It has lacteals, but they are not so numerous as in the small intestines.

The Rectum will be described with the Pelvis.

§ 4. OF THE LIVER (HEPAR, OR JECUR).

The LIVER secretes the bile, and is the largest glandular body in the human frame. Its position in the abdomen and the space it occupies have been mentioned. It is placed in the following relations, with neighboring parts. Above, it is in contact with the concavity of the diaphragm; below, it has the Omentum Minus, the Stomach, and the Transverse Arch of the Colon; and behind is the Vertebral Column, intercepted, however, by the lesser muscle of the diaphragm, and the Ascending Cava. When we lie on the right side, it is sustained by the ribs in the easiest posture; when on the left, it sometimes occasions uneasiness by pressing on the stomach; and when on the back, it compresses the ascending cava.

The liver, from being completely enveloped in peritoneum, has a smooth, glossy appearance, and is of a reddish-brown color. Its form is happily compared, by Professor Chaussier, to the section of an ovoid, made in the direction of its greatest diameter, the thick end being to the right side. It is fastened in its situation by the following reflections of the peritoneum. From the centre of the diaphragm, and extending from the umbilicus backwards to near the ascending cava, is the Falciform or Suspensory Ligament, consisting of two laminæ; it is thickened at its anterior edge by what was once the umbilical vein in the fœtus, but is now converted into a fibrous substance called the Round Ligament. This falciform ligament, divides the upper surface of the liver unequally into two, the left being the smaller; it also penetrates a notch in the anterior edge of the liver. On the right of the falciform process, and extending from the diaphragm to the posterior edge of the liver, is the Right Lateral Ligament; to the left of the same process, and also extending from the diaphragm to the back edge of the liver, is the Left Laternal Ligament; and that portion of peritoneum concerned in describing the periphery of this space, constitutes the Coronary Ligament. Within the circumference of the coronary ligament, the surface of the liver is not covered by peritoneum, but is attached to the diaphragm by loose cellular substance.

The precise shape of the liver is best seen in one removed from the body. The following parts are noticed by anatomists: its upper surface, its lower surface, its right extremity, its left extremity, its anterior edge and its posterior edge.

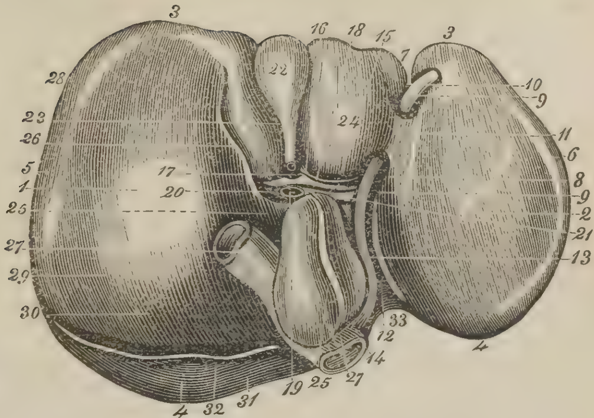
The upper surface is uniformly convex, adapts itself readily to the concavity of the under surface of the diaphragm, and presents nothing remarkable, but its equal division by the suspensory ligament.

The lower surface is very irregularly concave, and on it are the following appearances: From the front to the back edge, it is traversed by a deep fissure, corresponding in situation with the attachment of the suspensory ligament above, and with it, giving occasion to divide the liver into Right and Left Lobes. This is the Sulcus Umbilicalis, or umbilical fissure, occupied in front by what was the umbilical vein, and in the rear by what was the ductus venosus, both vessels in the adult being in a ligamentous state. Crossing this fissure at right angles, passing from the left lobe, for some distance into the right, and occupying about the middle third or fourth of the long diameter of the liver, is the Sulcus Transversalis, or Transverse Fissure. In it are the vena portarum, hepatic artery, and ducts, lymphatics and nerves, all of which are bound to each other by a close cellular substance. The Lobulus Spigelii or posterior lobe, is placed at the back of the liver, just to the right of the posterior part of the sulcus umbilicalis. It is like a ridge, and terminates forwards in a papilla which is one of the portæ of the liver; to the right, the lobulus spigelii sends off a small process, which unites it with the greater lobe of the liver, and is called the Lobulus Caudatus. On the front of the inferior surface, between the fore part of the umbilical fissure and the gall-bladder, is a flat rising, the Lobulus Anonymus or Quartus; its posterior extremity, opposite to the anterior of the lobulus spigelii, is the second gateway or porta of the liver.

The right extremity of the liver is very thick and almost fills the right hypochondriac region, but the left tapers to a very thin edge. The posterior border or edge, is thick and indented by the spine, but the anterior edge is thin. The former is sometimes converted into a complete canal, marked by a short large sulcus for the ascending vena cava; the latter only has the notch for the suspensory ligament already mentioned.

Besides the peritoneal coat, the liver has a second, which covers its whole exterior surface, adhering very closely to the peritoneum on one side, and to the liver on the other; it penetrates into the substance of the liver,

Fig. 11.



UNDER OR CONCAVE SURFACE OF THE LIVER.

1. Right Lobe.
2. Left Lobe.
3. Its Anterior or Inferior Edge.
4. Its Posterior or Diaphragmatic Portion.
5. Right Extremity.
6. Left Extremity.
7. Notch in the Anterior Margin.
8. Umbilical or Longitudinal Fissure.
9. Round Ligament or remains of the Umbilical Vein.
10. Portion of the Suspensory Ligament in connection with the Round Ligament.
11. Pons Hepatis, or Band of Liver across the Umbilical Fissure.
12. Posterior End of Longitudinal Fissure.

13, 14. Attachment of the obliterated Ductus Venosus to the Ascending Vena Cava.

15. Transverse Fissure.
16. Section of the Hepatic Duct.
17. Hepatic Artery.
18. Its Branches.
19. Vena Portarum.
20. Its Sinus, or Division into Right and Left Branches.
21. Fibrous Remains of the Ductus Venosus.
22. Gall-bladder.
23. Its Neck.
24. Lobulus Quartus.
25. Lobulus Spigelii.
26. Lobulus Caudatus.
27. Inferior Vena Cava.
28. Curvature of Liver to fit the Ascending Colon.

29. Depression to fit the Right Kidney.
30. Upper Portion of its Right Concave Surface over the Renal Capsule.
31. Portion of the Liver uncovered by the Peritoneum.
32. Inferior Edge of the Coronary Ligament in the Liver.
33. Depression made by the Vertebral Column.

and holds together its granulated structure.* This tunic is easily seen by stripping off the peritoneum, or in parts which naturally are left uncovered by the latter, as within the circle of the coronary ligament.

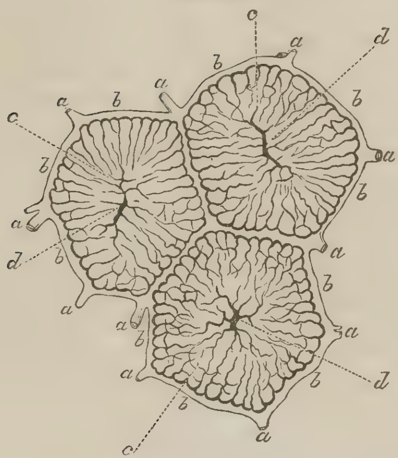
The bloodvessels are of three kinds. The first two bring the blood to the liver; the third takes it away, by emptying into the ascending cava. The Hepatic Artery, a branch of the cœliac, after having detached some smaller ramifications, gets to the transverse fissure of the liver and divides into three branches; one to the right lobe, one to the left lobe, and another to the lobulus Spigelii; they, however, subdivide before they reach the substance of the liver. These branches are between the sinus portarum and the biliary ducts.

The Vena Portarum being formed from the union of all the veins of the intestines, stomach, pancreas, and spleen, forms a single trunk about three inches long. It gets to the transverse fissure of the liver, over the duodenum and under the pancreas, and immediately sends off, at right angles, two branches, which, collectively, are called the Sinus of the Vena Portarum. The right branch, being the shortest and largest, is distributed to the great right lobe; the left sends its branches to the left lobe, lobulus spigelii, and anonymus.

At the bottom of the transverse fissure is a lamellated fibrous cellular tissue, closely adhering to the liver, which accompanies the vena portarum, the hepatic artery, and hepatic duct in their ramifications, forming sheaths for them as they go off successively. As the branches of these tubes keep together, they are united by the cellular sheaths, which may be considered as continuous with the processes sent in from the cellular coat. Glisson believed these sheaths to be muscular, and they have obtained the name of his capsule, although subsequent examination,

* See Sœmmering's Anatomy. Laennec's Journal de Médecine.

Fig. 12.



THE VASCULAR SYSTEM OF THE LIVER AS SEEN IN THREE OF ITS LOBULES.

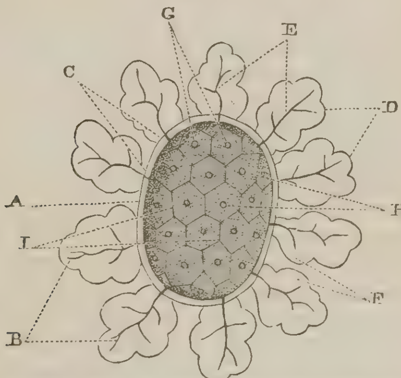
a, a, a. Interlobular Veins contained in the Spaces.
b, b, b. Interlobular Veins which occupy the Fissures, and which, with the veins in the spaces, form venous circles around the lobules.
c, c, c. The Lobular Venous Plexuses, the branches of which, communicating with each other by intermediate vessels, terminate in the Intralobular Veins. The circular and ovoid spaces, seen between the branches of the plexuses, are occupied by portions of the biliary plexuses constituting the acini of Malpighi.
d, d, d. The Intralobular Branches of the Hepatic Veins, in which the vessels of the plexuses terminate.

has proved him to have been in error. This capsule is frequently spoken of as lying on the afore-mentioned vessels, even before they reach the liver. The Hepatic Veins arise in the acini, from the capillary extremities of the hepatic artery and vena portarum. There are three principal trunks of them, coming, two from the right and one from the left lobe of the liver, and emptying into the ascending cava, just below the diaphragm; there are also five or six little trunks, coming from the posterior surface of the liver, and the lobulus spigelii, which empty into the ascending cava below the other. The hepatic veins have no valves, and may, in a section of the liver, be readily distinguished from other vessels by their lonely course, by their crossing the others at right angles, and by their thinness. All of these vessels of the liver are remarkable for the number of their anastomoses, and the facility of their communication with each other. A minute injection of either, pervades all parts of the liver, and the injection, if persevered in, will fill all the other vessels. By tearing the substance of the liver, a good view of its organization may be obtained; it will then be seen to be composed of an immense number of spherical, or polyhedrous grains, called ACINI, from their resemblance to berries. These are united to each other by the cellular tissue of the internal coat, and traversed by bloodvessels. Each of these grains is a representative of the gland, as its structure is complete in itself, being formed by the terminations of the bloodvessels, and by the origin of a branch of the hepatic artery, called the Porus Biliarius. When examined with a microscope, these acini are observed to be composed of a yellow and brownish substance, the yellow being the cortical portion.

The commencing radicles or ramifications of the Hepatic Duct, take their origin in the acini, and, as is said, upon the boundary between the two kinds of matter, avoiding the brown, and passing through the yellow or cortical. The larger branches converge into their respective trunks successively, or in pairs, while several of the primordial or most minute ones converge to the same point, giving a penicillous appearance. These several tubes constitute the Pori Biiarii, and are always in the same group with the branches of the Vena Portarum and Hepatic Artery. It is unsettled, whether these brush-like or penicillous ends of the Pori Billiarii are enlarged at their free extremities, so as to be there like a pin at its head, in the manner so common in glandular structures. Krause asserts the fact, and states that the enlargement measures from $\frac{1}{42}$ to $\frac{1}{37}$ of an English line, and there are said to be preparations of the kind at Utrecht. It is asserted that a fine injection passes more readily from them into the lymphatics than into any other order of vessels, which may account for the promptitude of jaundice, upon any obstruction of the hepatic duct.

According to the observations of Mr. Kiernan, the acini of anatomists generally should be called lobules, inasmuch as they consist in a collection of smaller granulated bodies, to which he restricts the name of acini. The principal objection to this is, the introduction of a new definition on a point heretofore considered as settled in the universal phraseology of anatomists; but as his descriptions are founded on this assumption, it may for the time be admitted. His statement is, that the finer branches of the vena portarum, which he calls Interlobular Veins, form a perfect and minute plexus, surrounding the lobules, or small granular masses of the liver; they there form convergent lines of

Fig. 13.



A Sublobular Vein divided transversely, together with its Constituent Lobules: the Hexagonal Bases are seen through the Parietes of the Vein, together with their Dividing Fissures and the Terminal Orifices of the Intralobular Veins.

A. Oblique Section of a Sublobular Hepatic Vein.
B. Longitudinal Section of Lobules, presenting a foliated appearance.
C. Bases of the Lobules resting on the Sublobular Vein.
D. External or Capsular Surfaces of the Lobules.
E. Intralobular Veins.
F. Veins of the Lobular Processes opening into the Central Vein.
G. Mouths of the Intralobular Veins, opening into the Sublobular Vein.
H. Bases of other Lobules seen through the Coats of the Vein, and forming the Parietes of the Canal in which the Vein is contained.
I. Interlobular Fissure seen through the Coats of the Vein.

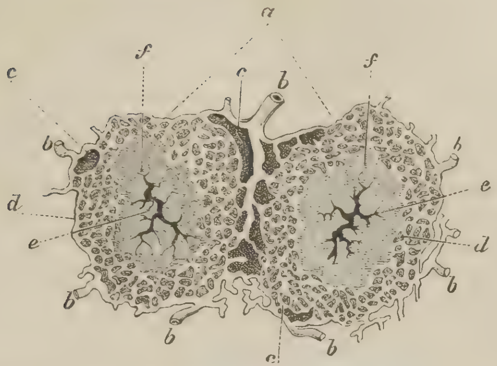
vessels directed towards the centre of each lobule, and communicating by transverse branches with one another. These latter connections, or the sets of veins making them, constitute the lobular venous plexus, and in their intervals are placed what he calls the acini or subordinate granules. He farther states that the Hepatic Duct forms a plexus upon the lobules like that of the vena portarum, the plexuses of the contiguous lobules being indisposed to anastomose, though he thinks there is ground to believe in such anastomosis. The interlobular biliary ducts there penetrate the lobule, and ramify by anastomotic connection through it. The Hepatic Artery also makes a plexus upon the surface of the lobule, and penetrates interiorly, from its periphery, towards the centre. Its ultimate branches supply the meshes of the vena portarum, of the vena hepaticæ, and of the biliary ducts, but their final termination is unsettled. Kiernan believes that it is in the vena portarum, and Meckel, that they end in the incipient branches of the venæ hepaticæ.

The Hepatic Veins, according to Mr. Kiernan, are seen as a small trunk in the centre of a lobule; this trunk arises from the convergence of from four to eight venules, from the periphery to the centre of the lobule. The trunks, having escaped each from its respective lobule, there unite with contiguous trunks similarly circumstanced; and as the arrangement is progressive, by the successive junction of larger and larger trunks, we have finally the large Hepatic Veins formed, which discharge into the ascending vena cava. [The student who is desirous of farther information on the minute structure of the liver, will do well to consult the paper of Professor Joseph Leidy, of the University of Pennsylvania, as published in the second volume of his edition of *Quain and Sharpey's Anatomy*.]

The nerves of the Liver will be mentioned at another place, along with the general account of such as belong to the Abdomen.

The Gall-Bladder (Vesicula, sive Cistis Fellea) is a reservoir for the bile, and is fixed on the inferior surface

Fig. 14.



THE INTERLOBULAR DUCTS ENTERING THE LOBULES AND FORMING THE LOBULAR BILIARY PLEXUSES.

a. Two Lobules.
b, b, b. Interlobular Ducts.
c, c, c. The Intralobular Cellular Tissue.
d, d. The External Portions of the Lobular Biliary Plexuses injected.
e, e. The Interlobular Branches of the Hepatic Vein.
f, f. The uninjected Central Portions of the Lobules. The interlobular ducts are here represented anastomosing with each other; but Mr. Kiernan remarks that he had not seen this communication. He infers the anastomosis from collateral circumstances.

of the great lobe, to the right of the umbilical fissure (from which it is removed by the lobulus quartus), in a broad shallow fossa. It is not placed in the line of the short diameter of the liver, but somewhat obliquely, its anterior end, which reaches to the edge of the liver, being turned to the right, and its posterior, which goes to the transverse fissure, being turned towards the left. Its shape is that of an oblong pyriform sac, the base being rounded off and the apex curved; the body diminishes gradually to the apex. The gall-bladder has three coats, a peritoneal, cellular, and mucous. The peritoneal coat is only a partial one, in consequence of the upper face of the gall-bladder being in contact with the liver. The second coat is cellular membrane, in which ramifies a great number of bloodvessels and lymphatics. The third is always tinged of a deep green, or yellow color, by the bile after death, though during life it is pale. On its internal face, it is thrown into irregular tortuous folds or wrinkles of extreme delicacy, in the intervals of which are many round or polyhedrous cells; some small, others a line and a half deep, particularly about the middle of the body. In the neck or apex of the gall-bladder, and in the beginning of the cystic duct, from three to seven or more elevated semilunar folds are formed of the internal membrane, which sometimes adopt a spiral arrangement, like a valve.

The parts contiguous to the gall-bladder, like its inner coat, are always tinged with bile after death, which does not occur in the living body. I have, however, in one case in our dissecting rooms, seen a gall-bladder in an old African woman, filled by a pint of very fluid, watery, greenish bile, and the tissue of which had been so lax, that a quart or more of the same secretion had percolated into the abdomen, probably before death.

The HEPATIC DUCT arises, as stated, by very delicate branches, from the Acini of the Liver. These branches are united into three or four trunks, in the transverse fissure, which trunks, again unite into a single one, the Hepatic Duct, about the size of a writing-quill, and eighteen or twenty lines long. The Hepatic Duct, joins at a very acute angle, with the Cystic Duct, which is somewhat smaller and shorter, and the two form the Ductus Communis Choledochus. The biliary canals thus formed, are situated in the right side of the Hepatico-Gastric, or lesser Omentum, in what is commonly called the Capsule of Glisson. The Ductus Communis being three inches, or three inches and a half long, is to the right of the Vena Portarum, and the Hepatic artery; descends behind the pancreas and the upper part of the duodenum, and passes obliquely between the coats of this intestine, for the distance of an inch, its orifice being as mentioned, at the back of the second turn of the intestine. The Ductus Communis sometimes receives the Pancreatic duct.

The Biliary ducts have two coats The external is a lamellated fibrous membrane, highly extensible, and having many bloodvessels. The internal is of the same character with that of the gall-bladder.

Fig. 15.

THE GALL-BLADDER AND ITS DUCTS.

1. Gall-Bladder.
2. Cystic Duct.
3. Hepatic Duct.
4. Its termination in the Duodenum.
5. Hepatic Artery.
6. Cystic Artery.
7. Ductus Communis Choledochus.

§ 5. OF THE SPLEEN (LIEN, SPLEN.)

This organ, as mentioned, is situated deeply in the left hypochondriac region, in the concavity of the Diaphragm at the left extremity of the stomach, and above the Colon. Its form approaches to the longitudinal section of an oval, being commonly four and a half inches long, and two and a half or three wide; but there is no viscus in which more frequent varieties of magnitude occur. I have seen it extending almost to the ilium, and but little smaller than the liver; and again, not by any means the length just mentioned as a medium size. Its transitions of magnitude are frequent and rapid in the same individual, depending on the stage of digestion, upon sickness, and probably on mental sensations. Several spleens sometimes exist in the same person. In such cases, the supernumerary ones are for the most part very small.

The Spleen has a partial division lengthwise, by a fossa, where the bloodvessels are connected with it. Its circumference is sometimes notched. Its color varies from a deep blue, which it is in early life, to a very dark brown. It is fixed by three processes of peritoneum, the names of which indicate their attachments; the Gastro-Splenic ligament or Omentum; the Splenico-Phrenic, and the Splenico-Colic ligaments.

The external coat of the spleen is obtained from the peritoneum, being a continuation of the processes just mentioned. The internal coat is a grayish, compact, extensible, elastic membrane, in close adherence with the external; it sends in processes to accompany the bloodvessels, and moreover, from its internal face, there proceed a multitude of lamellæ and of fibres which divide its cavity into cells. It seems to be intended to sustain the natural shape of the spleen, and to support its peculiar structure.

The spleen is remarkably well furnished with bloodvessels. The largest branch from the Cœliac artery, runs to it along the superior margin of the pancreas, and is distinguished by its tortuous course, and by the branches which it furnishes to the stomach and pancreas. It divides into several trunks just before it enters the spleen. The veins come out by an equal number of trunks, which unite into one trunk, attend the artery along the upper edge of the pancreas and joins the Vena Portarum. The splenic vein is destitute of valves.

In the body of the spleen are found many grayish, soft, semitransparent, gelatinous corpuscles, from an almost imperceptible magnitude to a line or more in diameter. By Malpighi, they are considered glandular; and by Ruysch, as convoluted vessels. The mass of the spleen, upon a superficial examination, seems to consist in a bloody dark-brown pulp, contained in the numerous cells of the internal coat. On this cellular structure, the vessels pass. M. Assolont considers that blood, besides existing in the arteries and veins, is placed in a state of particular combination, and of intimate union with the other organic elements of the viscus, and with a large quantity of albumen; that this peculiar combination of the blood forms the dark grumous fluid just mentioned, which may be easily seen by scraping the spleen with the handle of a scalpel. Of the latter, there can be no doubt; but a question arises whether it is contained in the cells I have just spoken of, as in the extremities of the vessels. Slight examination is in favor of the former, but M. Marjolin denies it, on the following grounds. That injections, cautiously made, pass immediately from the arteries into the veins; and that when the spleen, successively injected, is frozen, one can see no ice in the interstices of the vessels, while the capillary ramifications of the vessels, distended by the injected fluid, are distinctly seen. The probability then is, that the peculiar structure of the spleen is formed essentially of arterial and venous capillary vessels, with very delicate and extensible coats, that they communicate with each other without the intermedium of any cell, and that the extreme tenuity of these vessels, and their extensibility in every direction, are sufficient to explain the augmentation of volume which the spleen affords, under certain circumstances, and the promptitude with which it diminishes under others.

It has no duct, and is not known to secrete anything. Its probable function is, to act as a diverticulum of blood from the liver.

§ 6. OF THE PANCREAS (PANCREAS).

The PANCREAS secretes saliva, and is the largest of the salivary glands. It is an oblong conglomerate gland, extending across the spine, and fixed in the back and lower part of the epigastric region. It is connected to the spleen on the left, to the duodenum on the right, is behind the stomach, and between the laminæ of the transverse mesocolon.

The Pancreas is of a light gray color. It is about six or seven inches long and two wide, and would represent tolerably a parallelogram, if, at its right extremity, it were not swollen out into a head, to which Winslow gave the name of Lesser Pancreas. It has two faces, two edges, and two extremities. The anterior face is turned obliquely upwards, and corresponds with the superior lamina of the mesocolon. The posterior face is obliquely downwards, has a long fossa in its upper part for the splenic vessels, and is in contact with the aorta, vena cava ascendens, the superior mesenteric vessels, and several nerves.

The Pancreas has no peritoneal coat, excepting the mesocolon, neither has it a proper tunic, unless we should consider as such the lamina of condensed cellular membrane which envelops it, and which sends in processes between its lobules.

The structure of the pancreas strongly resembles that of the salivary glands, and consists of granuli, united into lobules, which form lobes, whose interstices are occupied with numerous vessels. The excretory duct of the gland arises from these granulations by very fine radicles, which, uniting, form larger cylinders, inclining from left to right. These latter empty successively into a long tube, the Ductus Wirsungii, going the whole length of the gland, and situated near the very centre of its substance. It is small at the splenic extremity, but gradually increases, till it becomes as large as a crow's quill at the other end. It is there joined by the duct of the lesser pancreas, and, after a short course, empties into the ductus communis choledochus, or runs at its side and makes a distinct opening into the duodenum, at the posterior part of its second curvature.

The arteries of the pancreas are principally derived from the splenic. The veins empty into the splenic vein.

§ 7. OF THE KIDNEYS (RENES).

To get a good view of the kidneys, the other abdominal viscera should be removed, or at least the intestines.

The KIDNEYS are two glandular bodies for the secretion of urine, fixed one on each side of the spine. They are in the back part of the lumbar regions, in a space extending from the upper part of the eleventh dorsal vertebra to the lower part of the second lumbar, though the right, in consequence of the pressure of the liver from above, is lower down than the left. They are deposited in a large parcel of fat on the upper part of the great psoæ, and quadrati lumborum muscles, as well as on the lower part of the greater diaphragm.

The shape of the kidney is a compressed ovoid, excavated on one side like a kidney-bean. The broad end of the ovoid is above, and the excavation presents obliquely forwards and inwards. The latter has a deep fissure in it for the passage of the bloodvessels and excretory duct. The kidney is hard and solid; its color is brown.

The kidney has not a peritoneal coat, but it has a proper capsule, which completely envelops it and penetrates into its fissure. The capsule is there perforated with many foramina for transmitting the bloodvessels. This membrane is fibrous, semitransparent, and somewhat elastic; it is easily peeled from the surface of the kidney, and, in doing so, we see that it adheres by a very delicate cellular and fibrous tissue and by some small vessels. The kidney being originally formed in lobes which subsequently unite, the vestige of this union is frequently preserved.

The kidney being laid open longitudinally, we shall obtain an idea of its internal arrangement. It is seen obviously to consist of two parts of different appearance; the external, which, from its position, is called *Cortical*, and the internal, *Tubular*.

In regard to the structure of the kidney, it receives from the aorta, at right angles, a large artery, the Emulgent, which divides into several branches as it approaches the fissure; these terminate by penetrating to all parts of the gland in a crowd of arterioles, so that when they are injected with wax and corroded the figure of the gland is preserved. Some of these minute arterial branches terminate in corresponding veins, and others in the glandular structure of the organ.

The Cortical part is the most vascular; it is on an average about two lines in depth, is made of granules called acini, and forms the periphery of the gland; but different portions of it project and form partial partitions between the tubular sections. It tears with facility, with a granulated edge or surface, and its color is a dark or reddish brown. When viewed with a microscope, the granulations are distinctly seen of extreme minuteness, and receiving the capillary extremities of the arteries. I have

Fig. 16.

LONGITUDINAL SECTION OF THE KIDNEY, WITH ITS RENAL CAPSULE.

1. Renal Capsule.
2. Cortical or vascular part of the Kidney.

3, 3. Uriniferous Tubes collected into conical Fasciculi.

4, 4. Papillæ, projecting into their corresponding calices.

5, 5, 5. The three Infundibula.

6. Pelvis of the Kidney.
7. Ureter.

more than once injected these granulations from the arteries, and observed the fluid coming through the ureter and the emulgent vein.

Fig. 17.

MAGNIFIED VIEW OF A DENUDED MALPIGHIAN CORPUSCLE, WITH ITS ATTENDANT VESSELS.

1. The Artery.
2. Tuft or Corpuscle.
3. Efferent Vein.

The second or Tubular portion of the kidneys, to the naked eye, consists of conoidal fasciculi of fibres, presenting their bases to the periphery of the organ, and their apices towards its centre. These cones are from twelve to eighteen in number (Pyramides Malpighianæ), and as mentioned, are partially separated from each other by processes from the cortical part; they are dense, of a lighter brown, and tear with facility in the course of the fibres. Each cone is formed by a great number of very fine canals, converging close to each other near the apex, and joining. They appear only to give passage to the urine, as cases have occurred in which they were entirely removed by suppuration and ulceration. The technical name for these canals is Tubuli Uriniferi; they begin in the cortical part of the kidney from the acini, and pass through it in a serpentine course. The terminations of the cones are called Papillæ, and an attempt has been made to establish for them some peculiarity of organization; but that idea is now abandoned, and they are generally admitted to be the same with the other portions of the tubular part. They have many orifices in them, which are the terminations of the tubes, and from which urine, in most subjects, can be readily squeezed.

The URETER is a canal which conveys the urine from the kidney to the bladder. It begins in its centre by a dilatation called Pelvis, and branches into several divisions called Calices, each of which ends in three or more funnel-shaped tubes, named Infundibula. Each of these embraces, by its expanded orifice, the base of the papilla, so as to permit the latter to project into it and distil its urine there; but sometimes, there are two papillæ to one infundibulum.

The Pelvis of the kidney is continued into the Ureter, a canal about the size of a writing-quill, and which is in contact behind with the psoas magnus muscle and the iliac and hypogastric vessels, crosses the vas deferens at the back part of the bladder, and passes obliquely through the coats of the latter, to end in an orifice a little behind that of the Urethra.

The excretory duct of the kidney has two coats, the external of which is fibrous and the internal mucous. The latter is said to be continued over the papillæ, and also, by some anatomists, to enter into the tubuli uriniferi. Its lower end is continuous with the internal coat of the bladder. The Ureter enjoys a great degree of extensibility and contractility of tissue, as shown in the transmission of large calculi, and its sensibility, though not perceptible in health, becomes exquisite in disease.

The emulgent veins are parallel with the arteries, and terminate in the vena cava ascendens.

§ 8. OF THE RENAL CAPSULES (CAPSULÆ RENALES).

These are two little triangular pyramidal bodies, one for each kidney, and rest by a concave base on its superior part. They are of a yellowish-brown color, somewhat tinged with red, have no excretory duct, and, being connected with some process of fœtal existence, are much larger then, than in the adult; their structure also seems to be much changed in the latter. They are about fifteen lines high, and as many wide. (See Fig. 16, at 1.)

On the exterior of their body is a proper coat formed of lamellated and condensed cellular tissue, which furnishes from its internal surface many prolongations, dividing the gland into lobes. These lobes are divisible into lobules, which again consist of a granulated structure that seems susceptible of other divisions. These granulations are not firm and resisting.

In the centre of each Capsula Renalis, there is occasionally a triangular cavity, which may be demonstrated by thrusting a tube in it, and inflating it, or by an incision. In the fœtus, this cavity contains a reddish viscid fluid, coagulable by alcohol; in children it becomes yellow; in adults it is dark-brown, and in old people it is either wanting, or in a remarkably small quantity.

The arteries of these bodies come from the emulgents, the phrenics, and the aorta. The veins terminate on the right side in the cava, and on the left, in the emulgent vein.

After removing the contents of the abdomen and thoroughly cleansing out all loose portions of the peritoneum, the student should now give his attention to the study of the bloodvessels and nerves of this region.

SECTION V.

OF THE BLOODVESSELS IN THE ABDOMEN.

§ 1. OF THE ARTERIES.

After the Aorta has passed through the diaphragm (or the muscle which separates the cavity of the chest from that of the abdomen), it is designated as the Abdominal Aorta, and may be seen passing almost in front of the bodies of the vertebra towards the pelvis, being pushed but very little to the left of the median line. It gives off several large branches to the viscera, and, at the inter-vertebral space of the fourth and fifth vertebræ of the loins, divides into the two large arteries, which are called the PRIMITIVE ILIACS. (See Fig. 18, at 2, 2.)

The PHRENIC ARTERIES come from the aorta, immediately on the latter emerging between the crura of the diaphragm. They are two in number, and named from their situations, Right and Left; they ramify on the concave surface of the diaphragm. Their origin is subject to variations.

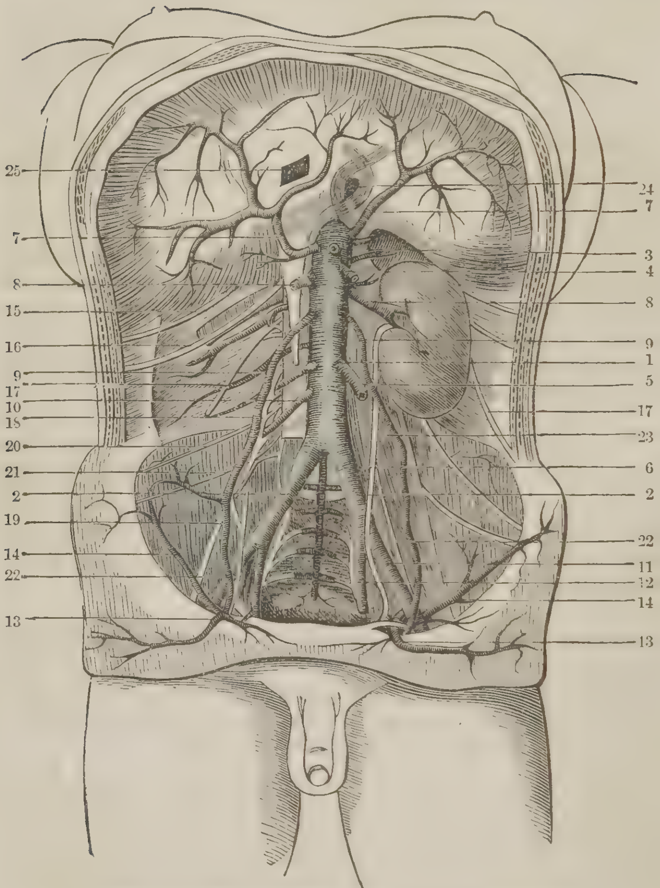
The CŒLIAC ARTERY (Arteria Cœliaca) is immediately below the phrenic; it is a large vessel about half an inch long, standing from the aorta at right angles, and divides into the Hepatic, Gastric, or Coronary, and Splenic Arteries. This division is the TRIPUS HALLERI.

The HEPATIC ARTERY goes to the liver through the capsule of Glisson, and is distributed through this viscus. Near the liver, it sends off the Right Gastro-Epiploic, which is distributed to the great curvature of the stomach, and the contiguous parts.

The GASTRIC ARTERY is between the other two; it joins the stomach near the cardia, and proceeds along the lesser curvature to the pylorus, supplying contiguous parts of the stomach.

The SPLENIC ARTERY is the largest of the three. It

Fig. 18.



ABDOMINAL PORTION OF THE AORTA AND ITS BRANCHES.

1. Aorta.
2, 2. Primitive Iliac Arteries.
3. Cœliac Artery cut across.
4. Superior Mesenteric cut.
5. Inferior Mesenteric cut.
6. Middle Sacral.
7, 7. Diaphragmatic or Phrenic Arteries.
8, 8. Renal Arteries.
9, 9. Spermatic Arteries.
10. Lumbar Arteries.
11. External Iliac Artery.
12. Internal Iliac Artery.
13, 13. Epigastric Artery.
14. Circumflex Iliac Artery.
15, 16. Musculo-cutaneous Nerves.

17, 17. External Musculo-cutaneous Nerves.
18. Lumbar Plexus of Nerves.
19. Crural Nerve.
20, 21. Superior and Inferior Musculo-cutaneous Nerves.
22, 22. Genito-crural Nerve.
23. Ureter.
24. Œsophageal foramen in the Diaphragm.
25. Foramen for the ascending Vena Cava.

goes tortuously along the upper edge of the pancreas to the spleen; in its course it sends to the stomach the Left Gastro-Epiploic, which is spent on its greater extremity and the left side of the greater curvature. From this vessel also are derived the Vasa Brevia of the stomach, and the Arteries of the Pancreas.

The Superior Mesenteric (Arteria Mesenterica Superior), is about half an inch below the cœliac, and is nearly of the same size; it passes downwards under the pancreas and above the duodenum, supplying all the small intestines, the right side of the colon, and its transverse arch. It has a great many anastomoses in it; constituted by a series of arcades, one upon the other, diminishing in size as they approach the intestine. That branch of the artery which supplies the junction of the ileum with the colon, is called Arteria Ileo-Colica; that which supplies the right side of the great intestine, is the Arteria Colica Dextra; and that which supplies the arch of the colon, is the Colica Media.

The Emulgent Arteries (Arteriæ Emulgentes), are two in number, one from each side of the aorta, coming off at right angles from it, and not much inferior in size to the mesenteric. The right is the longest, and passes behind the ascending vena cava. They go to the kidneys, and to the capsulæ renales. The arterial distribution from the aorta here, is subject to variations, the arteries of the capsulæ renales coming sometimes from the aorta, and on other occasions from the emulgents. There are also several arteries going to the adipose matter in which the kidneys are placed, which are equally unsettled in their origin.

The Spermatic Arteries (Arteriæ Spermaticæ) arise immediately below the emulgents, one on each side; they are about the size of a crow-quill, and are remarkable for their length. They pass downwards to the testicle, behind the peritoneum, and before the psoæ muscles, not far from the ureters, spermatic plexus of nerves, and spermatic veins. At the internal abdominal ring, the spermatic artery meets with the vas deferens, and, constituting a part of the spermatic cord, is distributed on the testicle in the manner described in the account of that organ. In the female, these arteries go to the ovaria, Fallopian tubes, and uterus.

The INFERIOR MESENTERIC ARTERY (Arteria Mesenterica Inferior) arises below the spermatics; it is much smaller than the superior. Three branches proceed from it, called the Left Colic Arteries, from their distribution to the left side of the colon, and are distinguished from each other by the terms Superior, Middle, and Inferior. The superior, anastomoses with the colica media, forming with it the great Mesocolic Arch. The others supply the sigmoid flexure of the colon, and the part just above it. A branch is continued from the inferior mesenteric to the rectum, constituting the Superior Hemorrhoidal Artery.

From the centre of the fork formed by the bifurcation of the aorta, there proceeds a small arterial tube, about the size of a crow-quill, called the MIDDLE SACRAL, from its running down to the os coccygis, just over the middle line of the sacrum. It sends branches on either side, towards the foramina in the sacrum.

The LUMBAR ARTERIES (Arteriæ Lumbares) are from three to five in number, on either side. They pass off at right angles from the aorta over the sides of the lumbar vertebræ; some of their branches penetrate the intervertebral foramina to get to the medulla spinalis, and others pass to the muscles of the back. Besides which, the lower parts of the parietes of the abdomen are supplied by them. They inosculate with the circumflexa ilii, with the epigastric, and with the gluteal arteries.

The PRIMITIVE ILIACS (Art. Iliacæ Communes), one on each side, are formed by the termination of the abdominal aorta; they extend from the fourth lumbar vertebra to the sacro-iliac junction, opposite to which they divide into two trunks, the External Iliac Artery, and the Hypogastric. In this course they give off no collateral branch of any consequence, and are crossed by the ureters.

If the pelvic viscera have been removed, the remaining arterial branches of this part may now be studied; but if not, proceed to their removal as stated in the account of the pelvis, and then trace out the following branches.

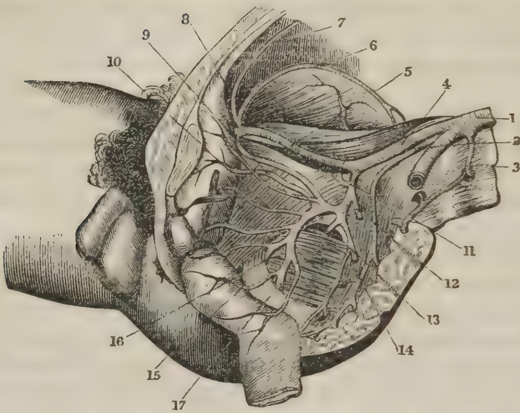
The Hypogastric or Internal Iliac Artery (Arteria Iliaca Interna, or Ramus Hypogastricus) gives off several branches, the origins of which differ considerably. The main trunk itself is of various lengths, and is distributed to the viscera of the pelvis, and to the muscles on its external surface. Sometimes it is previously divided into two principal trunks, an anterior and a posterior. From it the following branches proceed. (See page 110.)

1. The Ilio-Lumbar Artery (Arteria Ilio-Lumbalis) is commonly the first branch of the hypogastric, or of its posterior trunk. Arising from its posterior external part, it passes outwardly between the psoas magnus and iliacus internus muscles, and divides into two branches, one of which is distributed to the loins, and the other, upon the iliacus internus muscle.

2. The Lateral Sacral Arteries (Arteriæ Sacræ Laterales) come next, arising by one or more trunks from the hypogastric, or one of its large branches; they commonly equal in number the foramina of the sacrum, and, passing into them, are distributed upon the inferior part of the cauda equina; they also anastomose with the middle sacral artery.

3. The Obturator Artery (Arteria Obturatoria) comes from the hypogastric, or one of its trunks, and passes along parallel with the brim of the pelvis; going through the obturator foramen, it is distributed to the hip-joint, and to the muscles on the upper internal part of the thigh. Its origin is occasionally from the epigastric.

Fig. 19.



ARTERIES OF THE PELVIS.

1. Termination of the Aorta.
2. Middle Sacral Artery.
3. A Lumbar Artery.
4. Primitive Iliac Artery.
5. External Iliac Artery.
6. Circumflex Iliac Artery.
7. Epigastric Artery.
8. Remains of the Umbilical Artery of the Fœtus converted into a ligament.
9. Obturator Artery.
10. Vesical Artery.
11. Ilio-lumbar Artery.
12 and 13. Lateral Sacral Arteries.
14. Gluteal Artery.
15. Middle Hemorrhoidal Artery.
16. Internal Pudic Artery.
17. Ischiatic Artery.

4. The MIDDLE HEMORRHOIDAL ARTERY (Arteria Hemorrhoidea Media) comes sometimes from the gluteal. It is thus named from its relative position to the upper and lower hemorrhoidal arteries, on the rectum. Besides going to this organ, it supplies the prostate gland and the vesiculæ seminales of the male, and the vagina and bladder in the female.

5. The UTERINE ARTERY (Arteria Uterina) is peculiar to females, and gets to the uterus between the laminæ of its broad ligaments.

6. The VESICAL ARTERIES (Arteriæ Vesicales) are derived from what was the umbilical artery of the fœtus, and are distributed to the bladder.

What remains of the hypogastric, consists in two large branches, the GLUTEAL and the ISCHIATIC.

7. The GLUTEAL ARTERY (Arteria Glutæa) passes out of the pelvis at the upper part of the ischiatic foramen above the pyriformis muscle; it is situated in contact with the edge of the bone, and its trunk is accessible from the external parts of the pelvis. Having got to its outside, the trunk of the gluteal divides immediately into branches which are distributed upon the gluteal muscles.

8. The ISCHIATIC ARTERY (Arteria Ischiadica) coming from the inferior part of the hypogastric, is situated before the belly of the pyriformis muscle, and issues from the pelvis below its inferior edge, and in front of the sciatic nerve. It pursues its course downwards on the back part of the thigh, between the trochanter major and the tuberosity of the ischium, being there at the internal edge of the sciatic nerve. It is distributed to the inferior edge of the gluteus maximus, and to the muscular structure near the sacrum and coccyx; also, to the muscles on the back and upper parts of the thigh.

The INTERNAL PUDIC ARTERY (Arteria Pudica Interna) arises from the Ischiatic within the pelvis, emerges from the pelvis with the ischiatic, and then returns between the two sacro-sciatic ligaments, to the inner side of the tuberosity of the ischium, and continues on the inner side of the ramus of the ischium and of the pubis, towards the symphysis. In this course, it gives off several branches in the following order. A small branch to the lower edge of the pyriformis muscle. The Lower Hemorrhoidal Artery to the lower part of the rectum, and to the sphincter ani muscle. To the back part of the scrotum, the perineal muscles and the skin, it gives the Perineal Artery, originating near the transversus perinei muscle and passing in its direction. Upon the arrival of the internal pudic near the penis, it detaches to this body, a branch which penetrates and ramifies minutely through the structure of the corpus spongiosum urethræ. At the symphysis of the pubes, it sends off a branch which gets to the dorsum of the penis, and extends longitudinally, as far as the glans, being distributed to the elastic ligament, to the integuments, and to the prepuce; this is the Superficialis Dorsi Penis. Finally, the terminating branch of the internal pudic penetrates into the corpus cavernosum, passes straight forwards on the septum, and is distributed to the cells, by very minute branches, some of which go to the other side.

The EXTERNAL ILIAC ARTERY (Arteria Iliaca Externa) seems to be the continuation of the common iliac; it passes along the brim of the pelvis on the inner side of the psoas magnus muscle, to Poupart's Ligament. Here, it is about half-way between the symphysis of the pubes, and the anterior superior spinous process of the ilium, having the anterior crural nerve on its outside, and the external iliac vein on its inside. It gives off no branches till it reaches Poupart's ligament, when the Epigastric arises from it.

The EPIGASTRIC ARTERY (Arteria Epigastrica) at first passes inwards; it then rises upwards obliquely, till it reaches the exterior edge of the rectus muscle. Continuing afterwards to ascend, it is spent upon the anterior parietes of the abdomen by many branches, some of which inosculate with the internal mammary.

The CIRCUMFLEX ARTERY (Arteria Circumflexa Ilii) arises from the external iliac near the epigastric. It runs along the posterior edge of Poupart's ligament to the spinous process of the ilium, thence it continues its course near the internal margin of the crista, being distributed to the iliacus internus muscle. A branch of it, near the spinous process, rises upwards, and is spent upon the abdominal muscles. It anastomoses with the arteria iliolumbalis.

§ 2. VEINS OF THE ABDOMEN.

The VENA CAVA ASCENDENS is formed in the lower part of the abdomen, by the union of the External and Internal Iliac veins into the Common Iliacs, and the subsequent junction of the latter, at the fourth lumbar vertebra. This vein ascends on the right of the aorta, receives the Lumbar, the Spermatic, the Emulgent, the Capsular, the Hepatic, and the Phrenic Veins, and in its course penetrates the right opening of the diaphragm and terminates in the right auricle.

Each artery of the pelvis has its corresponding vein; it is therefore unnecessary to describe the latter, except in regard to peculiarities. About the neck of the bladder, vesiculæ seminales, and the base of the prostate, there is a considerable accumulation of veins, forming a very vascular plexus [which is sometimes opened in the operation of Lithotomy]; they come originally from the Vena Ipsius Penis, and from the proper vesical veins.

The several veins of the pelvis derived respectively from the ischiatic, gluteal, and internal pudic arteries, &c., accumulate at the sacro-iliac junction into one trunk, the INTERNAL ILIAC VEIN, which ascends by the side of the hypogastric artery, and joins the external iliac vein.

The Ascending Cava is joined at its fork, by the Middle Sacral Vein, and above it, by the Lumbar Veins on each side. The Right Spermatic Vein discharges into the Ascending Cava, but the left empties into the Emulgent of that side. The Emulgent and Capsular veins correspond with the arteries, the right being shorter than the left, from the position of the vena cava. The left emulgent vein is in front of the aorta.

The Ascending Cava is next joined by the Hepatic veins, which have been mentioned, and lastly, by the Phrenic.

The Venous Trunks, derived from the superior and inferior mesenteric arteries, and from those of the cæliac which do not go to the liver, as the splenic and gastric, form that large trunk, the Vena Portarum, the history of which is given in the account of the liver.

Such branches of the nerves as can be studied in the abdomen, will be found spoken of either in connection with the thorax or in the account of the nerves of the lower extremities.

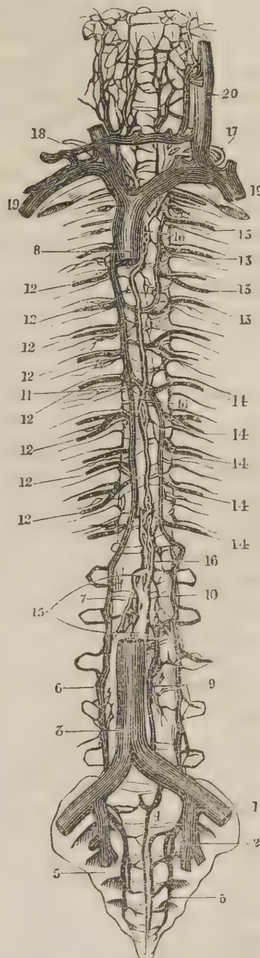
§ 3. THE THORACIC DUCT (VAS CHYLIFERUS).

By a careful dissection, the student may now see a portion of the Thoracic Duct, or the common trunk of the absorbent system. This commences most commonly at the second or third lumbar vertebra, in front of its body, by the union of the absorbent vessels of the lower extremities, pelvis, and intestines. This vessel, immediately after its formation, is sometimes subjected to a dilatation of various shapes and lengths, called the RECEPTACULUM CHYLI; after which, it proceeds regularly upwards in front of the vertebra, between the vena azygos and the aorta, to the upper part of the thorax. By opening the diaphragm, as in the dissection of the thorax, the thoracic duct will be seen passing between the crura of the diaphragm, after which, for some part of its course, it is immediately behind the œsophagus. At the fourth dorsal vertebra, it begins to incline to the left, and preserving that direction, gets into the neck as high as the upper edge of the seventh cervical vertebra, and just to its left side. Here it forms an arch, which, descending forwards and outwards, in front of the subclavian artery, between the internal jugular vein and the scalenus anticus muscle, terminates by an orifice protected by two valves, in the fork formed by the junction of the left internal jugular and subclavian veins.

Several interesting varieties occur in the Vas Chyliferus; sometimes two trunks are formed originally on the lumbar vertebræ, which run parallel with each other, and then unite at the lower dorsal vertebra. The thoracic portion of the duct varies in size and continuity, being divided once or oftener into two trunks, which unite again, and being also contracted at particular points. The cervical or terminating portion of the duct is occasionally divided into two tubes which have separate orifices. There is a very good plate in Caldani, representing the occasional terminations of the lymphatic trunks, in the region of the neck. In this plate, the thoracic duct empties, after a considerable dilatation, into the internal jugular vein, about an inch above its junction with the subclavian, and the lymphatics of the left side of the head and neck form two trunks, which discharge separately into

Fig. 20.

VENA AZYGOS AND THORACIC DUCT.



1. External Iliac Vein.
2. Internal Iliac Vein.
3. Ascending Cava.
4. Middle Sacral Vein.

5, 5. Lateral Sacral Veins.

6. Origin of the Greater Vena Azygos in the Lumbar Region and from the Lumbar Veins.
7. Its Trunk.
8. Its Termination in the Descending Cava.
9. Lumbar Veins of the Left Side, forming at
10. The Lesser Vena Azygos, which terminates at
11. In the Greater Azygos.

12, 12, 12. Eight or nine Inferior Intercostal Veins of the Right Side, opening into the Greater Azygos.

13, 13, 13. Superior Intercostal Veins, opening by a common Trunk into the Greater Vena Azygos.

14, 14, 14. Five Inferior Intercostal Veins of the Left Side, joining the Lesser Azygos.

15. Receptaculum Chili.

16, 16, 16. Thoracic Duct.

17. Its Termination in the Angle formed between the Left Internal Jugular and Left Subclavian Veins.
18. Right Thoracic Duct.
19. Subclavian Vein.
20. Internal Jugular Vein.

the convex side of the thoracic duct. The lymphatics of the left upper extremity form a trunk, whose orifice is in the subclavian vein, about an inch below its junction with the internal jugular.

The Lymphatics of the right arm, lung, right side of the neck and head, converge towards the junction of the right subclavian and internal jugular by four trunks, and then unite into one, which discharges itself at the posterior face of this junction. The venous orifice of this trunk, like that of the Thoracic Duct, is secured from a regurgitation of blood, by one or more valves.

[The cavity of the abdomen being now entirely empty, the student will have a good opportunity of studying such of the muscles as form its superior and posterior parietes. These are the diaphragm superiorly, and the muscles of the loins posteriorly.]

SECTION VI.

§ 1. THE DIAPHRAGM (DIAPHRAGMA).

The Diaphragm is a complete though movable septum, placed between the thoracic and the abdominal cavity; it is extremely concave below, and convex above, the concavity being occupied by several of the abdominal viscera. To view it properly, all the abdominal viscera should be removed, a large billet of wood placed under the loins of the subject, and the peritoneum carefully dissected off. It is particularly necessary to attend to the latter direction, in order to get a good view of the varied structure of this important organ; and the dissector, while performing it, is continually liable to the accident of a puncture being made through it into the thorax; in which case, the diaphragm loses its concavity, and, becoming flabby and displaced, the value and beauty of the display are much impaired.

The dissection being properly achieved, exhibits a broad concave muscle, connected with the inferior margin of the thorax on all sides, and having for its centre a silvery tendon, resembling in its outline the heart of a playing-card. This cordiform tendon occupies a considerable part of the extent of the Diaphragm, has its apex next to the sternum, and its notch towards the spine; the muscular part of the Diaphragm is inserted all around into its circumference. The cordiform tendon is nearly horizontal in the erect posture, its elevation being on a line with the lowest end of the second bone of the sternum. On each side of this tendon, some of the muscular fibres rise so high upwards before they join it that they are on a horizontal level with the anterior end of the fourth rib. The fasciculi of muscular fibres are, for the most part, convergent from the circumference of the thorax, and are easily separated from each other.

Fig. 21.

THE DIAPHRAGM.

1, 2, 3. Tendinous Centre of the Greater Diaphragm.
5, 6. Ligamentum Arcuatum.
7. Foramen of the Lesser Splanchnic Nerve.
8. Right Crura of Diaphragm.
9. Fourth Lumbar Vertebra.
10. Left Crura of Diaphragm.
11. Hiatus Aorticus.
12. Foramen Œsophageum.
13. Foramen Quadratum, for the passage of the Vena Cava.
14. Psoas Muscle.
15. Quadratus Lumborum.
16. Transverse Processes of the Lumbar Vertebræ.

In the Diaphragm are three remarkable foramina. The first (*Foramen Œsophageum*) is in the back of the muscle between the spine and the notch of the cordiform tendon, a little to the left of the middle line. It gives passage to the Œsophagus and the Par Vagum nerves along with it, and is rather a fissure or a long elliptical foramen, made by the separation and reunion of the muscular fibres; for above and below, at each end of the ellipsis, these fibres decussate each other in columns. To the right of this foramen and a little above its horizontal level, in the back part of the cordiform tendon, is a very large and patulous foramen (*Foramen Quadratum*) for the Asending Vena Cava. Its form is between an irregular quadrilateral figure and a circle; its edges are composed of fasciculi of tendon rounded off, and are not susceptible of displacement or of alteration in their relative position to each other, by which means any impediment which might arise from a different arrangement, to the course of the blood in the ascending cava, is obviated. Almost in a vertical line below, and about three inches from the foramen for the œsophagus, is the third hole in the diaphragm (*Hiatus Aorticus*), which affords passage to the Aorta. It is just in front of the bodies of three upper lumbar vertebræ, and is a much longer elliptical hole than the œsophageal; its lowest extremity or pole is constituted by the tendinous crura of the Diaphragm, and its upper by a decussation of muscular fasciculi arising from them. Through it, besides the Aorta, pass the Thoracic Duct, and the great Splanchnic Nerve of both sides.

In the horizontal position of either the dead or the living body, the right side of the Diaphragm ascends higher in the thorax than the left; but the weight of the liver makes it, in the vertical posture, descend lower than the other.

Thus circumstanced, the detailed origin of the Diaphragm is as follows: It arises fleshy from the internal face of the upper edge of the Xiphoid Cartilage; from the internal face of the cartilages of the seventh, eighth, and ninth ribs; from the osseous extremities of the tenth and eleventh, and from both the osseous and cartilaginous termination of the twelfth rib. As the line described includes almost the whole of the circle, and the fibres all converge to the cordiform tendon, they of course will pass in different radiated directions, and be of different lengths, which it is unnecessary to specify. Between the sternal and costal portions, on each side, there is a triangular fissure filled with fatty cellular tissue, which sometimes leaves an opening for Hernia. I have seen a case of this kind, in which the transverse part of the Colon was the subject of protrusion into the Thorax. It is probable that greater displacements of the abdominal viscera into the thorax of adults or children may have had a congenital origin in this very fissure, and are subsequently, when the parts are modified to this unnatural situation, set down as a Lusus Naturæ. The portion thus described is called the Greater Muscle of the Diaphragm.

Besides these origins, the Diaphragm has several from the vertebræ of the loins, called its crura, there being four on each side of the foramen for the aorta. The first pair, entirely tendinous, comes from the front of the body of the third vertebra of the loins, and is prevented from being very distinct in its origin, in consequence of running into the ligament in front of the bodies of all the vertebræ. The second pair of heads is on the outside of the first, and arises tendinous from the intervertebral ligament, between the second and third vertebræ. The third pair of heads arises tendinous from the upper part of the lateral margins of the second lumbar vertebra. And the fourth pair of heads comes also tendinous from the fore part of the roots of the transverse processes of the second lumbar vertebra. These tendinous heads terminate in what is called the Lesser Muscle of the Diaphragm, which is inserted into the notch of the cordiform tendon. It will now be understood that the aorta passes between the heads of the lesser muscle, and that the œsophagus has a hole in the upper part of its belly.*

The origin of the Diaphragm is completed between its greater and lesser muscles, by a tense ligament, called the Ligamentum Arcuatum, which passes from the root of the transverse process of the first lumbar vertebra to the inferior part of the middle of the twelfth rib; with the upper edge of this ligament the Diaphragm is connected; and with the lower, the psoas magnus muscle. At the margin of the other ribs, the Diaphragm is connected with the transversalis abdominis.

The action of this muscle, in assisting respiration, is

* This origin of the lesser muscle of the Diaphragm is given by Albinus, but it is difficult to make out fairly, and for the most part it would do much better to say that it arises tendinous from the first, second, and third vertebræ. The heads are occasionally much smaller on one side than the other.

very obvious; its fibres passing in a curved line with their convexity towards the thorax, from the bony margin of the thorax to the cordiform tendon, and having a tendency to become straight by contracting, will descend, and thereby enlarge the thorax. It is not certain that the cordiform tendon descends, its connections being too strong and numerous to admit of much motion. In expiration, the relaxation of the Diaphragm, with the contraction of the abdominal muscles, restores the former to its first state. In vomiting, the Diaphragm and abdominal muscles concur to expel the contents of the stomach.

§ 2. MUSCLES OF THE LOINS.

The PSOAS MAGNUS muscle, arises fleshy, from the side of the bodies of the last dorsal, and of the four upper lumbar vertebræ, and from the transverse processes of all the lumbar vertebræ. It forms an oblong fleshy cushion on the side of the lumbar vertebræ, and, constituting the lateral boundary of the inlet to the pelvis, it passes out of the pelvis, under Poupart's ligament about its middle.

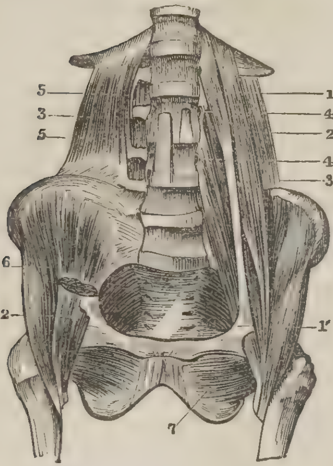
It is inserted, tendinously, into the trochanter minor of the os femoris, and fleshy for an inch below it.

It bends the body forwards or draws the thigh upwards.

The PSOAS PARVUS, arises fleshy, from the contiguous edges of the last dorsal, and of the first lumbar vertebra at their sides, and from the intervertebral ligament. It is at the anterior and internal edge of the psoas magnus; has a short belly, and a long tendon, by which it is inserted into the linea innominata, about half-way between the spine of the pubes and the junction of this bone with the ilium. The tendon, besides, is expanded into the fascia iliaca.

Its use seems to be, to draw upwards the sheath of the femoral vessels which is derived from the fascia iliaca, and consequently to draw upwards the vessels themselves, which probably diminishes the liability to injury from their too great or sudden flexion. This muscle is sometimes wanting.

Fig. 22.



1. Small Psoas Muscle.
1'. Insertion of the Tendon of the same into the Iliac Fascia cut.
2. Great Psoas Muscle.
3. Quadratus Lumborum Muscle, partly concealed by the two Psoas Muscles.
3'. Same of Right Side entirely exposed.
4, 4. Foramina formed by the Grooves upon the Bodies of the Lumbar Vertebræ, and the Origins of the Great Psoas Muscle, for the passage of the Lumbar Arteries and Veins.
5, 5. Inter-Transverse Muscles.
6. Iliac Muscle entirely exposed by the removal of 2', Great Psoas Muscle cut.

The Iliacus Internus Muscle, occupies the concavity of the ilium, being on the outside of the psoas magnus. It arises, fleshy, from the transverse process of the last lumbar vertebra, from the inner margin of the crista of the ilium, and from its whole concavity; also from the anterior edge of the concavity of the ilium at and above the anterior inferior spinous process, and from that part of the capsule of the hip-joint near this process.

This muscle terminates in the tendon of the psoas magnus, just above the insertion into the trochanter minor.

It has the same action with the psoas magnus, and from their also having a common tendon, they might with propriety be considered as only one muscle.

The QUADRATUS LUMBORUM is an oblong muscle arising from the crista of the ilium, by a tendinous and fleshy origin of two or three inches in length. It lies at the side of the lumbar vertebræ, and is inserted into all their transverse processes by short tendinous slips. It is also inserted into the lower edge of the last rib near its head, and into the transverse process of the last vertebra of the back.

It bends the loins to one side, and will draw down the last rib. This muscle is covered posteriorly, by the tendinous origin of the transversalis abdominis muscle, which separates it from the sacro-lumbalis and longissimus-dorsi. It may also be very well seen from behind, in the dissection of the back.

CHAPTER III.

OF THE MALE PELVIS.

The first step of the student, after a short examination *in situ* of the contents of the pelvis, should be to detach the penis from its bony connections, and to remove it, with the bladder and rectum, from the pelvis, provided he does not wish to dissect the perineum. But if he proposes to study the structure of this latter region upon the same subject, he should first conduct his dissection as directed in Section II. of this chapter. When after this the pelvic contents are removed, a clean dissection of these organs should be made by detaching the surrounding fat, cellular membrane, and muscles. This dissection may be best made with the scissors, and its utility will be in proportion to its cleanness; the latter being much assisted by inflating the bladder and by stuffing the rectum. The scrotum may be separated and laid aside for future examination.

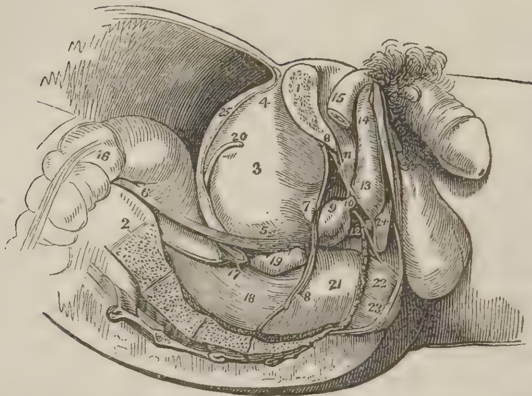
[A good idea of the relative position of the pelvic viscera in the male will be obtained by a lateral section, similar to that made in Fig. 23, but it is not worth while to make this section in every case.]

SECTION I.

OF THE VISCERA OF THE MALE PELVIS.

The Rectum, being the termination of the colon, begins at the left sacro-iliac symphysis; from thence it passes obliquely downwards towards the middle of the sacrum, about one-half of its length; after which its course is directly downwards in front of the sacrum and os coccygis, till it terminates in the anus; its orifice there pointing backwards and downwards. This viscus is round, till

Fig. 23.



A SIDE VIEW OF THE VISCERA OF THE MALE PELVIS, *in situ.* THE RIGHT SIDE OF THE PELVIS HAS BEEN REMOVED BY A VERTICAL SECTION MADE THROUGH THE PUBIS NEAR THE SYMPHYSIS, AND ANOTHER THROUGH THE MIDDLE OF THE SACRUM.

1. The Divided Surface of the Pubis.
2. The Divided Surface of the Sacrum.
3. The Body of the Bladder.
4. Its Superior Fundus; from the Apex is seen passing upwards the Urachus.
5. The Inferior Fundus of the Bladder.
6. The Ureter.
7. The Neck of the Bladder.

8, 8. The Pelvic Fascia; the Fibres immediately above 7 are given off from the Pelvic Fascia, and represent the Anterior Ligaments of the Bladder.

9. The Prostate Gland.
10. The Membranous Portion of the Urethra, between the two Layers of the Deep Perineal Fascia, or the Triangular Ligament.
11. The Triangular Ligament, or Deep Perineal Fascia formed of two Layers.
12. One of Cowper's Glands between the two Layers of the Triangular Ligament, and beneath the Membranous Portion of the Urethra.
13. The Bulb of the Corpus Spongiosum.
14. The Body of the Corpus Spongiosum.
15. The Right Crus Penis.
16. The Upper Part of the Rectum.
17. The Recto-vesical Fold of Peritoneum.
18. The Middle Portion of the Rectum.
19. The Right Vesicula Seminalis.
20. The Vas Deferens.
21. The Rectum covered by the Descending Layer of the Pelvic Fascia, just as it is making its bend backwards to terminate in the Anus.

22. A part of the Levator Ani Muscle investing the lower part of the Rectum.
23. The External Sphincter Muscle.
24. The Interval between the Superficial Perineal Fascia and the Triangular Ligament, or Deep Fascia; they are seen to be continuous beneath the number, much more distinctly than is really the case.

just before its termination, when it dilates into a pouch, which is spread out on each side of the prostate, and is apt to be cut in the lateral operation of lithotomy.

The inferior third of the rectum is destitute of peritoneum; its anterior face is in contact with the lower fundus of the bladder, the vesiculæ seminales, and the prostate gland. Posteriorly and above, it is confined to the sacrum by the mesorectum, which conducts its nerves and bloodvessels. At this period the student should notice the dip of the peritoneum between the vesiculæ seminales, where it almost touches the base of the prostate gland.

The muscular structure of the rectum is remarkably strong, consisting externally of longitudinal and parallel fasciculi of fibres, close together, and internally of circular fibres which form a thick and continued plane, particularly on a level with the lower fundus of the bladder. Just below the pouch of the rectum these circular fibres are multiplied so as to form a perfect Internal Sphincter Muscle. Many of the longitudinal fibres on getting to its inferior margin, pass beneath it, and are then turned upwards for about an inch, so as to be inserted into the mucous coat, or rather its cellular substance. The mucous membrane of the gut is smooth above, but at the lower part it is thrown into several longitudinal folds called the Columns of the Rectum, at the lower end of which are some small, blind pouches, the orifices of which look upwards. These pouches are occasionally the seat of disease, and produce, when enlarged, a painful itching. An original observation of Dr. Physick on the nature of this affection, and the remedy for which consists in slitting them open or removing them, induced me to look for the ordinary natural structure, which I have found to be as just described. The Anus is thrown into radiated folds from the influence of the external sphincter ani. In some subjects, large cells are formed in the cavity of the rectum, by transverse doublings of the mucous coat only, resembling the valvulæ conniventes of the small intestine, and there is also frequently a sort of valve formed, which presents a barrier to the involuntary evacuation of the feces.

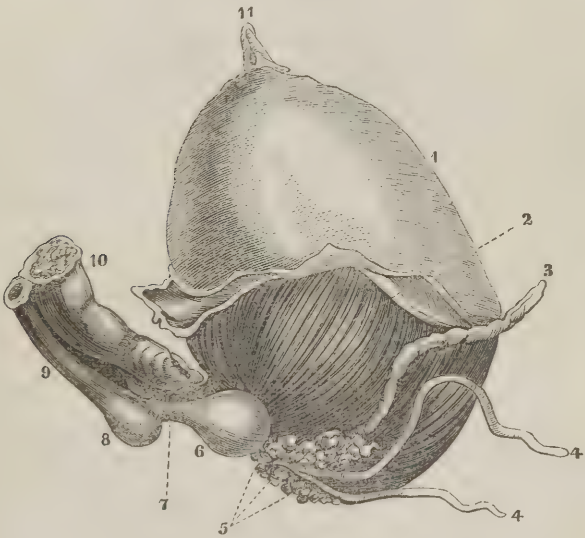
The BLADDER (Vesica Urinaria) is the reservoir for the urine. It is fixed just behind the symphysis of the pubes, and when pressed upon by the neighboring viscera, is somewhat flattened before and behind; but when removed from the body and distended, it resembles an elongated sphere, of which the greatest diameter is vertical in regard to the linea ileo-pectinea. The technical name for each end of the sphere is the Fundus, one being called the superior and the other the inferior; the lower being somewhat the more obtuse. From the upper end of the bladder a long conical ligament, called the Urachus, proceeds to the navel. It is placed between the linea alba and the peritoneum, and produces a slight doubling or elevation of the latter. In mankind the urachus is solid, but some very rare cases are reported in which it was so hollow as to permit the urine to flow through it from the bladder. By putting the anterior parietes of the abdomen on the stretch, we shall see starting out and protruding the peritoneum into a semilunar duplicature on each side of the urachus, the remains of the umbilical arteries of the fœtus, which now are called the Round Ligaments of the Bladder, though they have but little or no influence on it. At the anterior part of the lower fundus, the bladder is somewhat elongated into a process called its Neck, which resembles a truncated cone, and is the commencement of the urethra.

The bladder consists of four coats, the Peritoneal, Muscular, Cellular, and Mucous.

The PERITONEAL is a very incomplete coat, placed upon the upper and posterior parts of the bladder; it passes from the bladder to the muscles of the abdomen before, and in man to the rectum behind. The peritoneal coat is connected to the muscular coat by very loose cellular membrane, which prevents it from participating in any considerable distension of the organ, and permits it to leave the anterior face of the bladder, so that its reflection to the recti muscles in these cases, is placed much above the pubes. Tapping the bladder is performed at this point, as well as the high operation for the stone.

The MUSCULAR coat of the bladder consists of flattened fasciculi of white fibres passing in very varied directions, and separated to some distance from each other. Many of them arise from the neck of the bladder, and pass before and behind, upwards towards the urachus, where they end; others, arising laterally from the same place,

Fig. 24.



THE BLADDER AND SOME OF THE ASSOCIATED PARTS.

1. Peritoneal Coat.
2. Longitudinal Muscular Fibres, or Detrusor Urinæ.
3. The Ureter.
4, 4. Vasa Deferentia.
5. Vesiculæ Seminales.
6. Prostate Gland.
7. Membranous Portion of the Urethra.
8. Bulb of the Urethra.
9. Urethra.
10. Corpus Cavernosum cut off.
11. The Urachus.

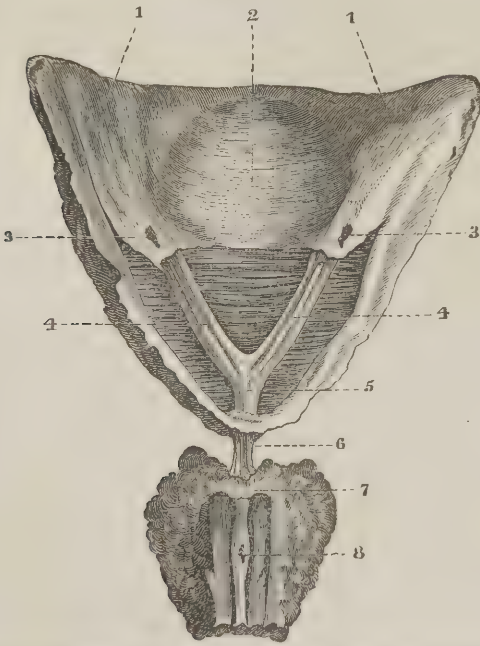
pass up in a corresponding course and also terminate at the urachus. There are many transverse and oblique fibres uniting these together, but still leaving interstices through which the internal coat occasionally protrudes, and thus forms cells in the cavity of the bladder. There is an accumulation of fibres about the neck of the bladder and the urachus, which gives an increased thickness at these points.

The CELLULAR coat consists of a close, dense, lamellated, and filamentous tissue, highly extensible and difficult to tear. It is impervious to water, closely adherent to the muscular and mucous membranes, and pervaded by many vessels and nerves which it conveys to the mucous coat.

The MUCOUS or internal coat of the bladder, though called villous, has less of this appearance than that of the stomach. It is white, with a slight tinge of red; abounds with mucous follicles, which, in a state of health, are difficult to be discerned; possesses great extensibility and but little contractility, in consequence of which it is thrown into folds passing in various directions when the bladder is not very full. It offers several points for observation. 1. A triangular space between the orifice of the urethra and those of the ureters (the Vesical Triangle), which is elevated into a plain, smooth surface. 2. The Uvula Vesicæ, a small pointed production, terminating the triangle in front, and formed by a projection of the third lobe of the prostate gland into the cavity of the bladder. 3. The orifices of the ureters, about an inch behind the orifice of the urethra, and forming the lateral angles of the vesical triangle. 4. The Inferior Fundus (Bas-Fond of the French), a depression of the general concavity of the bladder, making it lower than any other part, placed between the base of the triangle and the posterior side of the bladder. 5. The Internal Orifice of the neck of the bladder, resembling somewhat the neck of a Florence or oil flask.

The Neck of the Bladder is thicker than any other part; it is surrounded by cellular tissue, in which a great number of veins is found, and it penetrates in front, the prostate gland, which has a continual tendency to close it. It has a sphincter muscle formed in the following way, which may be seen by removing the lining membrane. A transverse fasciculus crosses its inferior semi-

Fig. 25.



A View of a Portion of the Inside of the Bladder, with the Prostate Gland appended to it by the Attachment of the Common Tendon of the Muscles of the Ureters.

1, 1. Inside of the Bladder.
2. Lower Fundus.
3, 3. Mouths of the Ureters.
4, 4. Muscles of the Ureters, from which the Mucous Membrane has been dissected.
5. Junction of the Muscles at the apex of the Vesical Triangle.
6. Tendon of the United Muscles.
7. Middle Lobe of the Prostate, and Point of Insertion, according to Sir Charles Bell.
8. Caput Gallinaginis, the Point of Insertion according to Dr. Horner.

circumference from one lateral lobe of the prostate gland to the other; this fasciculus is half an inch wide and from one to two lines thick, and is placed ever the third lobe of the prostate. The superior semicircumference is also crossed by a thin layer of muscular fibres, which spreads itself out at the ends, where it is lost in the ordinary muscular structure which it resembles exactly.

Under the mucous membrane, corresponding with the vesical triangle, there is a muscle of the same shape and dimensions, the posterior corners being inserted around the orifices of the ureters, and the anterior attached to the caput gallinaginis.

§ 1. PROSTATE GLAND (GLANDULA PARASTATA).

The prostate gland is a body about the size and form of a horse-chestnut [or buck-eye], fixed, as stated, on the neck of the bladder, and penetrated by the urethra, which traverses it much nearer its superior than its inferior surface. The base of it is turned backwards, and the point forwards; its inferior surface rests upon the rectum, and its sides, in the distensions of this organ by feces, are overlapped by it. The Prostate has, posteriorly, a notch in its centre, which divides it into two lateral lobes, and by raising the vesiculæ seminales, we shall see where their excretory ducts penetrate the gland, and separate from the body of it the little tubercle called the Third Lobe, a part which is often the seat of disease.

The organization of this body seems to consist in a condensed, white, extensible, though easily lacerated fibro-cellular tissue, and within it are placed a great number of mucous follicles, which form from eight to twelve ducts,* passing obliquely forwards, and terminating in the urethra at the sides of the urethral crest or Caput Gallinaginis. The fluid secreted is thick, ropy, white, and semitransparent in a healthy state. The Prostate is surrounded by a fibrous capsule, of which more hereafter.†

* Loder says there are from thirty-two to forty-four.

† An opinion prevails among the anatomists of Philadelphia, that the prostate is larger in the African than in whites. Indeed, this much may be said of all the organs of generation in both sexes.

Cowper's Glands are two in number, and are situated in advance of the prostate, between the laminæ of the triangular ligament, at the point where the bulb of the urethra adheres to it. These glands are also intended for the secretion of mucus, or a fluid very much like it, into the canal of the urethra. Commonly they are about the size of a garden-pea, but not unfrequently much smaller, and in some instances cannot be found at all. They are yellowish and hard bodies, consisting of several lobules united together, and each one has an excretory duct, that readily receives a bristle, which passes obliquely forwards between the corpus spongiosum and the canal of the urethra, to terminate in an oblique orifice in the latter, about an inch distant from the gland. One or more glands of the same description, and discovered by Littre, are occasionally found just in front of Cowper's. They also discharge their secretion into the adjacent part of the urethra.

The Seminal Vesicles (Vesiculæ Seminales) are two convoluted bodies of two inches in length, one on each side of the lower fundus of the bladder, approaching each other very nearly at the base of the Prostate, but diverging much as they recede. (See Fig. 26.) They are separated before by the interposition of the vasa deferentia; and being fixed between the rectum and the bladder, they are matted to the latter by a close cellular texture, having many large veins pervading it.

When inflated and dried, they present the semblance of cells, but are in fact long tubes, which, by being convoluted, are reduced to the apparent dimensions mentioned; there are also several pouches on each side of this long tube which increase the number of cells. The convolutions are preserved by the intermediate cellular tissue.

These bodies consist of two coats, an external, which is fibrous and cellular, and an internal, which is mucous, being a continuation of the lining membrane of the bladder. The excretory duct of each vesicle is about a line and a half long, when it joins in the substance of the prostate, with the vas deferens of the same side; a common canal (Ductus Ejaculatorius) is thus formed, which runs parallel with its fellow, below the urethra. They are commonly filled by a drab-colored thick fluid, supposed to be a mixture of the semen and of their own proper secretion, though of this, Mr. Hunter doubted.*

Fig. 26.

BASE OF THE BLADDER WITH THE VESICULÆ SEMINALES, URETERS, AND PROSTATE GLAND.

1. Muscular Structure of the Bladder.
2, 2. Ureters.
3, 3. Vasa Deferentia.
4. Vesicula Seminalis.
5. Same of the opposite side, dissected out to show its tubular character.
6. Efferent Duct of the Vesicula Seminalis, which joins the Duct of the Vas Deferens to form at 7 the Ductus Ejaculatorius.
8. Prostate Gland.
9. Urethra.

The DUCTUS EJACULATORIUS is about eight or ten lines long, and opens by an oblong orifice, at the lateral anterior face of the Caput Gallinaginis; it is larger behind than before, which gives it a conical shape, and allows fluids injected, to pass freely from the vas deferens to the vesicula, or the reverse.

§ 2. OF THE PENIS (MEMBRUM VIRILE, MENTULA).

The Penis is a membranous and cellular body, affixed to the margin of the pelvis at and below the symphysis pubis, and appropriated to the passing of urine and semen. It is formed by the common integuments, by cellular tissue, by the corpus cavernosum, and by the corpus spongiosum.

The skin covering the penis is more thin and delicate than in most other parts of the body, and is furnished with a considerable number of sebaceous follicles, more particularly about the root of the organ. It is very

* See Observations on the Animal Economy.

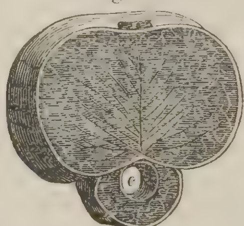
loosely connected by cellular membrane to the parts beneath, so that it is easily made to correspond with all states of the penis. At the anterior extremity it is arranged into a duplicature or fold, the Preputium, which is inserted just behind the glans; the inferior part of the prepuce is connected with the extremity of the glans by a process called Frænum.

The penis, besides arising from the bones of the pelvis in a manner which will be presently explained, is fixed to the symphysis pubis by a ligament (Ligamentum Suspensorium) which is a triangular fibrous body, flattened laterally and lost insensibly on the fascia of the thigh covering the adductor muscles. The portion of it which goes to the penis, arises in front of the symphysis pubis, and is inserted into the dorsum of the penis near its root; from this insertion it is extended over the penis, and according to Mr. Colles, constitutes one of its coverings, by going as far as the glans. Professor Marjolin says that he has seen, on several occasions, muscular fibres entering into its composition, and in that case, it draws the organ with more force towards the anterior parietes of the abdomen, and one strongly marked instance has also been presented to me in my own dissections.

The Corpus Cavernosum of the penis forms by much the most considerable portion of the whole organ. Externally, it is a white fibrous membrane of a dense structure, enjoying extensibility, and an extreme degree of contractility; its fibres pass for the most part longitudinally, except about the root, where they are blended with the periosteum of the bone and with the tendons of the muscles. This coat of the penis is occasionally called its elastic ligament. It arises by two conical crura, one, from the internal face of the crus of each pubes and ischium, to within a little distance of the anterior part of the tuber ischii. At the lower part of the symphysis pubis, these crura join and form a body, which, when stripped of its connections, resembles two cylinders lying along side of each other and united; anteriorly they terminate in common by a truncated cone, covered obliquely by the glans. At the posterior part of the corpus cavernosum, in its centre, there is a tolerably complete septum of the same kind of substance, separating its two halves from each other; but anteriorly this septum is imperfect, having an arrangement like the teeth of a comb, whence the term, Septum Pectiniforme.

In the middle of the corpus cavernosum above, is a longitudinal depression for lodging the veins of the penis, and in the same manner below, another for the corpus spongiosum urethræ. The cavity of this membrane is filled by a spongy tissue, which arises from its internal face and is formed of filaments and little laminæ; they, by crossing each other, form a multitude of cells which have a perfectly free communication, and generally are somewhat occupied by blood.

Fig. 27.



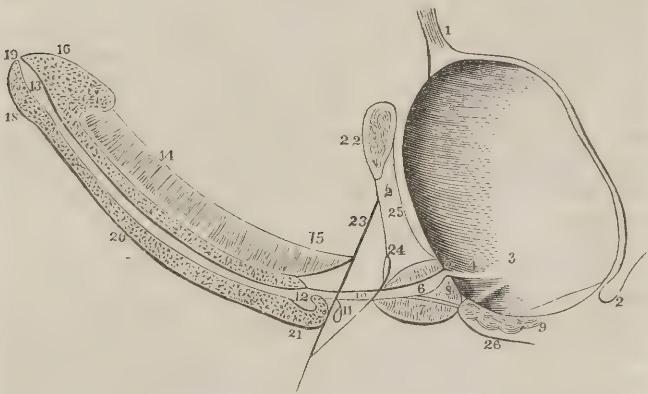
Transverse Section of the Penis.

a, a. **The Corpora Cavernosa.** *c.* **Urethra.**
b. **Corpus Spongiosum Urethræ.**

The Corpus Spongiosum Urethræ extends from ten or twelve lines behind the junction of the crura of the corpus cavernosum, to the anterior extremity of the penis. Externally, it is covered by a coat resembling that of the corpus cavernosum, except that it is thinner. In its centre, is the canal for the urine. Between this canal and the coat is a spongy structure, much finer than that of the corpus cavernosum, and though the cells communicate freely, still, they have the appearance of convoluted veins. The corpus spongiosum is not of the same thickness in its whole course; its commencement in the perineum where it is pendulous, is enlarged into what is termed its Bulb;

from this it diminishes gradually to the end of the corpus cavernosum, where it is again enlarged into the Glans Penis. The transverse diameter of the glans being larger than that of the body of the penis, it forms all around a projecting shoulder, the Corona Glandis. The surface of the glans is covered by thin skin, making a very delicate epithelium, and a great number of papillæ for the termination of nerves. Numerous follicles also exist about the corona glandis, to secrete the sebaceous fluid which collects there, in persons who are not cleanly. They constitute the glandulæ odoriferæ Tysoni.

Fig. 28.



SECTION OF THE BLADDER AND PENIS.

1. Urachus.
2. Vesico-Rectal Reflection of the Peritoneum.
3. Opening of the Right Ureter.
4. Slight Ridge leading to the Neck of the Bladder.
5. Commencement of the Urethra.
6. Prostatic Portion of the Urethra.
7, 8. Prostate Gland; between these two figures is seen the Right Ejaculatory Duct.
9. Right Seminal Vesicle.
10. Membranous Portion of the Urethra.
11. Cowper's Gland.
12. Bulbous Portion of the Urethra.
13. Fossa Navicularis.
14. Right Cavernous Body.
15. Root of the same.
16. Head of the Penis.
18. Lower Segment of the same.
19. External Meatus of Urethra.
20. Corpus Spongiosum.
21. Bulb of the Corpus Spongiosum.
22. Section of the Pubic Symphysis.
23. Cut Edge of the Deep Perineal Fascia, or Triangular Ligament.
24. Posterior Layer of the same.
25, 26. Pelvic Fascia.

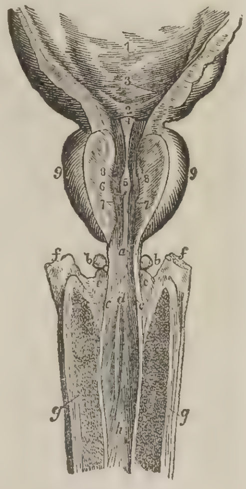
The URETHRA is a mucous canal whose length varies according to the degree of erection in the penis, and extends from the neck of the bladder to the extremity of the glans. It has several curvatures, and receives in its course the ducti ejaculatorii, the excretory ducts of Cowper's glands, and the mucous lacunæ of its internal membrane. The first part of this canal which traverses the prostate gland, is about fifteen or eighteen lines in length; it is the Prostatic portion, and is well supported by this body, although its own sides are very thin. On its inferior surface, is the Verumontanum or Caput Gallinaginis, an oblong projection of the lining membrane, an inch in length, broad behind where it commences a little in advance of the Uvula Vesicæ, and coming to a point very gradually before. In the posterior ridge of the caput is a long cleft, which is the orifice of a lacuna observed first by Morgagni; and on the front surface on each side, is the orifice of the ductus ejaculatorius. On the sides of the caput gallinaginis, the canal of the urethra is depressed into something like a cul-de-sac, where are to be found the orifices belonging to the lacunæ of the prostate gland, as stated.

Between the Prostate and the Bulb is the Membranous Part of the urethra, about eight or ten lines long; it is unprotected except by a soft covering, which seems in some measure to be a mixture of gelatinous matter and muscular fibre. The former was considered by Littre as a glandular body which secreted a viscid humor into the interior of the canal; the latter probably is the part described by Winslow as the inferior prostatic muscle, which, arising on each side of the membranous canal, goes to be inserted into the corresponding branch of the pubes, near the symphysis. The membranous part of the urethra does not get into the end of the bulb, but penetrates it from above, half an inch or more occasionally, from its extremity, just below the junction of the crura of the Corpus Cavernosum.

The canal varies in its dimensions; at its commencement in the bladder it is large; it then contracts at the back of the caput gallinaginis, and immediately en-

Fig. 29.

THE PROSTATIC, MEMBRANOUS, AND PART OF THE SPONGY PORTION OF THE URETHRA, WITH PART OF THE BLADDER.



1. Internal Surface of the Bladder.
2. Vesical Trigone.
3. Openings of the Ureters.
4. Uvula Vesicæ.
5. Urethral or Gallinaginous Crest,
6. Opening of the Sinus Pocularis.

7, 7. Openings of the Ejaculatory Ducts.
8, 8. Openings of the Prostatic Ducts. The numbers 7, 7, and 8, 8, are placed on the cut surface of the Supra-urethral portion of the Prostate Gland.
9, 9. Lateral Lobes of the Prostate Gland.
a. Membranous Portion of the Urethra.
b, b. Cowper's Glands.
c, c. Mouths of the Ducts of the same.
d. Commencement of the Spongy Portion of the Urethra.
e, e. Upper Surface of the Bulb.
f, f. Roots of the Cavernous Bodies.
g, g. Corpora Cavernosa.
h. Spongy Portion of the Urethra.

larges in the fore part of the prostate, at the sides of the urethral crest. The membranous part is small; the canal then enlarges in the bulb. In the body of the penis, the canal is successively diminished till it comes almost to the glans, when it is so remarkably enlarged as to get the name of Fossa Navicularis; it terminates finally by a short vertical slit at the extremity of the glans.

In the whole length of the canal, there are two whitish middle lines, one above, and the other below, and in the membranous and spongy portions, excepting the fossa navicularis, longitudinal folds of the lining membrane exist, which are effaced by distension. In the upper part of the canal, there are a great many mucous lacunæ; Loder, in his plates, has marked about sixty-five; there is one particularly large in the upper surface of the fossa navicularis, which, it is said, has stopped the point of a bougie, and been mistaken for stricture.

Sir Everard Home formerly communicated to the Royal

Society a highly interesting paper on the structure of the lining membrane of the urethra. From his microscopical observations, he was induced to think that it was muscular.

Mr. Shaw, of London, has described a set of vessels immediately on the outside of the internal membrane of the urethra, which when empty are very similar in appearance to muscular fibres. He says he has discovered that these vessels form an internal spongy body which passes down to the membranous part of the urethra, and forms even a small bulb there.* His preparation, being a quicksilver injection of the part, is certainly a very satisfactory demonstration of their existence; yet in my own observations I have not been able to distinguish them from the cellular membrane, connecting the canal of the urethra to the corpus spongiosum.

The arteries of the penis come from the internal pudic; some of the veins follow the course of the arteries, and others collect into the two venæ dorsalis penis; the nerves come from the Superior and Inferior Pudendal.

§ 3. OF THE TESTICLES (TESTES).

These bodies, two in number, are surrounded by several coats, the most external of which is common to both the testicles, and is called Scrotum; the others are called the Dartos, Tunica Vaginalis, and Tunica Albuginea.

The SCROTUM is a sac formed by a continuation of skin from the internal sides of the thighs, from the inferior part of the penis, and from the anterior part of the perineum. It is very thin, darker than the rest of the skin, sparingly covered with hairs, has many sebaceous follicles in it, and is closely united to the cellular membrane beneath. It is very extensible, and has a great power of contraction, its surface being covered with wrinkles, which are more apparent when it is contracted. It consists of two symmetrical halves, marked off from each other by an elevation of the skin, the Raphé, which extends from the perineum

* See Med.-Chir. Trans. vol. x.

over the Scrotum, along the inferior surface of the penis to the end of the latter.

Beneath the scrotum is the DARTOS, a fibrous membrane which is vascular, reddish, and deprived of fat; it arises from the inferior margins of the crura of the ischia and pubes, and passing downwards it rejoins the raphé; it is then reflected upwards, forms a septum between the two sides of the scrotum, and goes up to the inferior part of the urethra. This membrane has been confounded with cellular substance; but it appears from the reports of Messieurs Chaussier, Lobstein, and Breschet, that it does not exist in the scrotum till the descent of the testicle, and that it is an expansion of the gubernaculum testis.

Notwithstanding its great contractility, the question of its muscular structure is not settled, and certainly, in the greater part of its extent, there is not the appearance of muscular fibre; but at its posterior end, just at the anterior point of the sphincter ani, I have often seen a broad muscular expanse, the character of which could scarcely be misconceived.* The contractility of the scrotum has been attributed to the cremaster muscle, instead of this membrane, but common observation will convince most persons that the elevation of the testicles in the scrotum by the contraction of the cremasters, is very distinguishable from that contraction of the scrotum by which the testicles are squeezed against the sides of the pubes, and the scrotum brought into a hard corrugated mass.

The CREMASTER MUSCLE is an imperfect coat, and belongs rather to the spermatic cord; its course has been explained in the account of the abdominal muscles. Its fibres are much separated on the tunica vaginalis; they lay on its front part, and on the internal and external sides of the spermatic cord. Within the last, is a coat of cellular substance, the Tunica Vaginalis Communis, which connects the dartos and the cremaster muscle with the tunica vaginalis.

The TUNICA VAGINALIS TESTIS was originally a process of peritoneum, though it appears in the adult as a

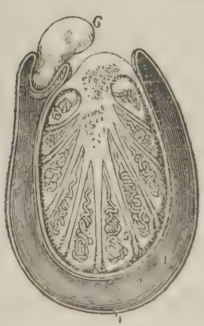
* I have dissected one subject since this (Jan. 1839), where the fibres were evidently muscular, though interwoven.

complete sac. The testicle being protruded into it from behind, one-half of the sac applies itself closely to the epididymis and testicle, while the other half is loose; the whole arrangement being precisely after the manner of a double nightcap when drawn over the head. It passes up some distance on the cord; its cavity is smooth, polished, and moistened by a synovial halitus, which allows the surfaces to move freely upon each other. This cavity may be injected with but little force, so as to hold an ounce or more of fluid. It is the seat of Hydrocele.

The TUNICA ALBUGINEA is the proper coat of the testicle, preserves its form, and is in immediate contact with the glandular structure. It is a dense, strong, white fibrous membrane, corresponding very much in its general characters with the tunica sclerotica of the eye. From the internal surface of the albuginea, several membranous processes, forming partial partitions (Septulæ Testes), pass off, and terminate at the posterior part of the cavity in the Corpus Highmorianum. These septulæ, conduct the bloodvessels through the substance of the gland, and form little apartments, which support, confine, protect, and nourish the tubular structure of the testes. The Corpus Highmorianum is a longitudinal projection of the tunica albuginea, somewhat broader above than below; its upper part is perforated by the vasa efferentia.

Fig. 30.

A TRANSVERSE SECTION OF THE TESTICLE.



1. The Cavity of the Tunica Vaginalis.
2. The Tunica Albuginea.
3. The Mediastinum giving off numerous fibrous cords in a radiated direction to the internal surface of the tunica albuginea. The cut extremities of the vessels below the number belong to the rete testis, and those above to the arteries and veins of the organ.
4. The Tunica Vasculosa.
5. One of the Lobules, consisting of the convolutions of the Seminiferous Tubules, and terminating by a single duct. Corresponding Lobules are seen between the other fibrous cords of the mediastinum.
6. Section of the Epididymis.

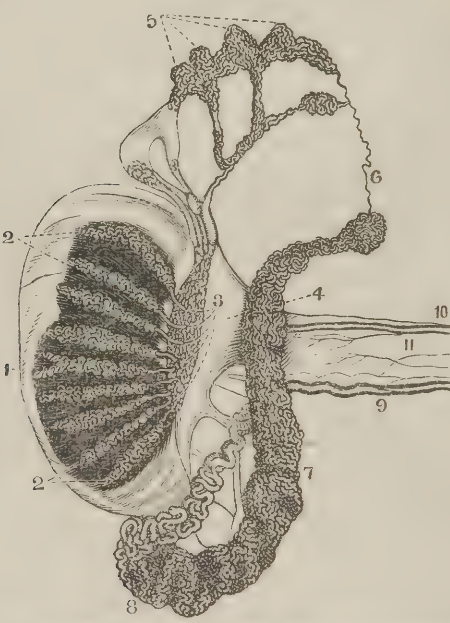
The form of the Testicles as communicated by the tunica albuginea, is very much that of an oval, somewhat compressed laterally, the edges presenting forwards and backwards; they do not hang with the long diameter vertical, but the upper end is advanced a little forwards, and the lower points somewhat backwards. They are both of the same size generally, but in case of a difference the right is larger; it is also higher up than the left, a circumstance which has been marked by sculptors in all ages.

The glandular structure of the testicle consists of a congeries of zigzag tubes (Tubuli Seminiferi), stated by Monro to amount to three hundred, whose diameters do not exceed individually the one two-hundredth part of an inch, and, when extended to their full length, would form in the aggregate a tube 5208 feet long. These tubes, almost inconceivably fine as they are, can be injected in a retrograde course through the vas deferens, with mercury, but the task is one of exceeding difficulty, and scarcely ever succeeds fully.

The TUBULI SEMINIFERI, it has been stated, fill up nearly the whole of the cavity of the Tunica Albuginea, being kept from each other by the processes termed Septulæ. These tubes send out a great number of trunks, which, from their observing a straight course, obtain the name of Vasa Recta. These vasa recta unite near the centre of the testicle, and form a network, the Rete Testis. From the rete testis there proceed from twelve to eighteen tubes, which pass through the upper part of the Corpus Highmorianum, and get to the outside of the tunica albuginea; these are the Vasa Efferentia. Each of these vasa is rolled up externally at this place, so as to give the outline of a cone, therefore it gets the name of Conus Vasculosus. Each cone successively empties into a single tube on the back of the testis, which is prodigiously convoluted and forms a large body, the Epididymis.

The EPIDIDYMIS is a prismatic arch enlarged at both extremities, and resting vertically on the back of the testicle, being connected with it by the tunica vaginalis. The enlargement above is the Globus Major, and is formed of the coni vasculosi, but what remains of this body below consists of one tube excessively convoluted.

Fig. 31.



The Anatomy of the Testicle. The several Parts of the Organ have been injected with Mercury and then unravelled.

1, 2, 2. Tubuli Seminiferi.
3. Vasa Recta, forming the Rete Testis.
4. Corpus Highmorianum.
5. Vasa Efferentia, forming the Coni Vasculosi.
6. A single Tube formed by the junction of the Vasa Efferentia. This tube then becomes convoluted upon itself to form the Epididymis.
7, 8. Beginning of the Vas Deferens.
9. The Vas Deferens becoming a straight, isolated Tube in its ascent to the Abdominal ring.
10. Spermatic Artery.
11. Spermatic Cord, dissected and spread out.

The enlargement below is the Globus Minor; after this is formed, the tube becomes less convoluted and turns upwards on the inside of the epididymis, and a little farther on, it becomes nearly straight, and is called Vas Deferens. There is a blind duct which commences at the top of the epididymis and terminates below, the intention of which is not known. It is called the Vasculum Aberrans Halleri, and varies in length from one and a half to fourteen inches. Its use is unknown.

The Vas Deferens is a white tube about half a line in diameter, having a cartilaginous feel; its cavity is large enough to admit a bristle. It passes on the back of the spermatic cord, and continues with it through the abdominal canal At the internal ring it leaves the residue of the cord, and dipping into the pelvis by the side of the bladder, goes between it and the ureter to the lower fundus, approaching its fellow, on the inside of the vesiculæ seminales, and ending in the urethra, by the Ductus Ejaculatorius. About two and a half inches from its termination it becomes somewhat tortuous, and enlarges.

The Spermatic Cord is formed of the Vas Deferens, the Spermatic Artery and Veins, Lymphatics, Nerves, and Cellular membrane, all covered by the Cremaster muscle. The artery arises from the aorta and retains its first size till it arrives at the testis; it then divides, some of its branches being spent on the epididymis, and the remainder going into the testis, and terminating on the tubes. The veins in ascending form a remarkable plexus, the Corpus Pampiniforme; at the internal ring they unite into one trunk, which on the right joins the ascending cava, and on the left the emulgent vein.

SECTION II.

OF THE PERINEUM AND FASCIÆ OF THE MALE PELVIS.

In order to study the perineum to advantage it is better to leave the rectum, bladder, and penis in their natural position, and dissect the perineum on a second subject, after having previously studied these viscera as described on page 123. This being done, the subject should be fixed in the posture required for lithotomy, and a horizontal cut made through the skin, at the junction of the raphé of the perineum with the scrotum, extending it on each side three inches. Then, making another transverse cut of the same length over the end of the os coccygis, drop a perpendicular cut, equally profound with the first, from its middle to the point of the os coccygis. The skin constituting the flap on each side being then carefully raised up, so as not to injure the subjacent parts, the structure of the perineum will be sufficiently open for the time when these two flaps are pinned aside.

The PERINEAL FASCIA [Superficial] is first exposed; it occupies nearly all the space between the anus and the posterior margin of the scrotum, insensibly blending with the latter; and between the rami of the pubes and of the ischia, being very firmly fixed to these bones. This fascia, in case of rupture in the posterior part of the urethra, prevents the urine from showing itself in the perineum, and drives it into the cellular structure of the scrotum. In abscesses of the perineum, it also prevents the fluctuation from being very evident. Having studied well its connections, structure, and influence, it is to be raised up and turned to each side by a cut down its middle, in order to bring into view the Perineal muscles.

The ERECTOR PENIS MUSCLE is so situated as to cover the whole of the crus of the penis, which is not in contact with the bony margin of the pelvis. It arises, therefore, from the anterior part of the tuber ischii, tendinous and fleshy; its fleshy fibres, adhering to the internal and external margins of the rami of the pubes and ischium, proceed upwards, and, just before the union of the crura of the penis, end in a flat tendon, which is lost on the side of the corpus cavernosum of the penis.*

* The late Dr. Lawrence informed me that he has frequently found muscular fibres between the bone and the crus penis.

Its use is not well understood.

The Accelerator Urinæ Muscle lies on the bulb and back part of the corpus spongiosum urethræ; it is a thin muscle consisting of oblique fibres.

It arises by a pointed production from the side of the body of the penis, and its origin is continued obliquely across the inferior surface of the crus penis, where the latter begins to form the body of the penis. It arises also from the inner side of the ramus of the pubes, between the crus penis and the triangular ligament of the urethra. The muscles of the opposite sides, are inserted into each other, by a white line which marks the middle of the bulb of the urethra, and by a point, into the anterior extremity of the sphincter ani, where they are joined by the transversi perinei.

In order to see the origin of these muscles very distinctly, separate them from each other in the middle line, and dissect them from the corpus spongiosum. Cut transversely through the corpus spongiosum, about three inches before the triangular ligament, and dissect it clearly from the corpus cavernosum, turning it downwards so that it may hang by the membranous part of the urethra. By putting the two acceleratores on the stretch, it will be seen that, besides the origins mentioned, they arise also from each other by a tendinous membrane that is interposed between the corpus spongiosum and cavernosum, so that they literally surround the posterior part of the urethra, constituting a complete sphincter muscle for it. This account of the accelerator urinæ, being peculiar to myself, is adopted from a strong analogy between it and the sphincter vaginæ muscle.

These two accelerator muscles are considered by M. Chaussier, as forming but one; in that case the origin will be reversed, and commence in the middle line of the perineum, instead of terminating there. The relation of this muscle and the erector penis should be observed, in order to appreciate the difficulty of getting into the membranous part of the urethra in lithotomy, without cutting through the muscular fibres of one or the other.

It propels the urine and semen forward.

The TRANSVERSUS PERINEI MUSCLE, as its name implies, passes directly across the perineum; it arises from the inner side of the ischium just at the origin of the erector penis, and is inserted where the sphincter ani and the acceleratores urinæ join.

I have observed that, when the lower part of the accelerator was extended much below its usual line, and strongly developed, the transversus perinei was very irregular in its origin and course, consisting frequently of a few fibres which did not deserve the name of a distinct muscle, and were almost unappropriated in the adipose matter of the part.

Occasionally a fasciculus of muscular fibres exists, called, by Albinus, Transversus Perinei Alter, which arises in front of the first, and is inserted into the perineal junction, just behind it. It seems generally to be a loose fasciculus of the accelerator urinæ muscle.

The use of these muscles seems to be, to contribute to fix the bulb of the urethra.

The SPHINCTER ANI muscle consists in a plane of fibres which surrounds the anus, in order to keep it closed. The long diameter of the ellipsis is extended from the coccyx towards the symphysis pubis, and has its angles very much elongated; the anterior may be traced, terminating insensibly in the posterior face of the scrotum. It has two fixed points, the last bone of the os coccygis behind, and the perineal union of the other muscles in front; its lateral diameter occupies about one-half of the space between the tuberosities of the ischia, as it is in the middle of this space. The point of it, in front, is continued into the dartos.

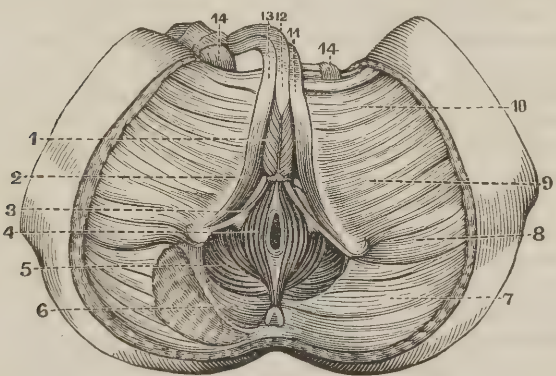
Besides closing the orifice of the rectum, it will draw the bulb of the urethra backwards, or the point of the os coccygis forwards.

The COCCYGEUS MUSCLE rather belongs to the interior of the pelvis, but is seen well enough here. It arises by a small, tendinous, and fleshy beginning, from the spine of the ischium, and, lying on the anterior face of the anterior sacro-sciatic ligament, is inserted into the side of the last bone of the sacrum, and into all those of the os coccygis.

It draws the os coccygis forwards.

It frequently happens that there is on each side a small fasciculus of muscle, arising from the inferior bone of the Sacrum in front, and inserted into the bones of the coccyx. It is called the Sacro-Coccygeus.

Fig. 32.



PERINEAL MUSCLES OF THE MALE.

1. Accelerator Urinæ.
2. Erector Penis.
3. Transversus Perinæi.
4. Sphincter Ani.
5. Levator Ani.
6. Coccygæus.
7. Glutæus Maximus.
8. Adductor Magnus.
9. Gracilis.
10. Adductor Longus.
11, 13. Corpora Cavernosa.
12. Urethra.
14, 14. Spermatic Cords.

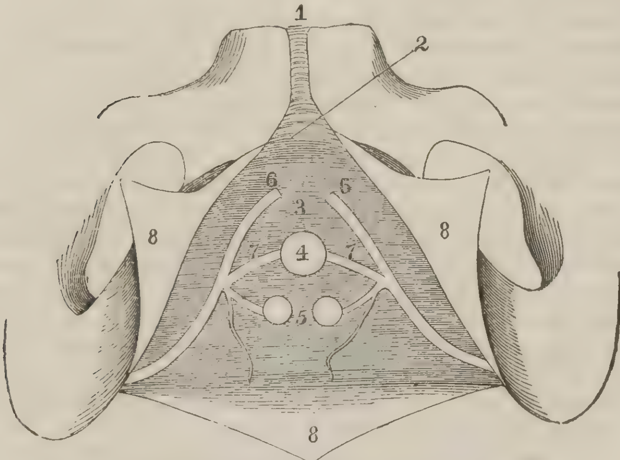
The Erectores Penis, Acceleratores Urinæ, and Transversi Perinei, are now to be removed. A large quantity of adipose and cellular matter will then be found on each side of the rectum, between it and the parietes of the pelvis, concealing the levatores ani muscles. This fat is better left *in situ* for the present.

The muscles being removed, the bulb of the urethra may be seen to great advantage, extending in the middle of the perineum almost to the anus. It is not loose and pendulous as described, but is connected by its superior face to the Triangular Ligament of the urethra [or deep perineal fascia], a membrane which fills up the space below the symphysis of the pubes. This ligament is a septum between the perineum and pelvis, and, when closely examined, is seen to connect itself to the internal edges of the rami of the pubes and ischia, at the inner posterior sides of the crura penis, as far down as the beginning of the latter. At its lower edge its ligamentous character is not so well defined. It extends from the top of the pubic arch downwards an inch and a half, filling up all the intermediate space between the bones. On its anterior surface is the bulb of the urethra, and just at the extremity of the latter, inclosed by the ligament and adhering to it, are Cowper's Glands. A perforation exists in it, through which passes the membranous part of the urethra. To get a view of this opening, the corpus spongiosum, if not already detached, must be cut through an inch anterior to the symphysis pubis, dissected carefully from the corpus cavernosum, and turned down on the perineum. The opening at first is not very apparent, in consequence of its edges being continued a little distance on the canal, but by detaching them the hole becomes well defined.

Here it becomes necessary to attend to the relative situation of the bulb, and of the membranous part of the urethra. The former has just been described going towards the anus; the latter passes upwards towards the neck of the bladder; they consequently form a considerable angle with each other, and the membranous part of the urethra is much the deeper; the recollection of this is all-important in lithotomy, as it teaches us to avoid the one, and to cut into the other. It will also be observed that the hole in the triangular ligament is an inch below the symphysis pubis.

By dissecting off the upper corner of the triangular ligament, we are made acquainted with another just behind it, which is totally distinct. This ligament is half an inch broad, thick and strong, particularly at its lower edge, and is very firmly attached laterally to each pubes, just below the symphysis. Mr. Colles calls it pubic ligament, with great propriety. I would suggest, as somewhat more expressive, the term Inter-Pubic ligament, as it serves to distinguish it from another called pubic, which is above the pubes.* The breadth of this having been stated at half an inch, it is obvious that the hole in the triangular ligament is half an inch below the lower edge of the inter-pubic ligament.

Fig. 33.



VIEW OF THE DEEP PERINEAL FASCIA.

1. Symphysis Pubis.
2. Sub-pubic Ligament.
3. Triangular Ligament, or Deep Perineal Fascia.
4. Perforation for the Urethra.
5. Two Prominences of the Anterior Layer of the Fascia, marking the Position of the included Cowper's Glands.
6. Pudic Arteries.
7. Arteries of the Bulb.

8, 8, 8. The Superficial Perineal Fascia dissected off in three angular Flaps.

We have now seen as much as can be viewed advantageously from the perineum, at this stage of the dis-

* See Abdominal Muscles.

section, and I recommend an inspection of the parts from above, on the side of their abdominal surfaces. The pelvis should therefore be separated from the trunk at the last lumbar vertebra, and the posterior part of the pelvis removed, by sawing through the os ilium, from its crista to the upper margin of the sciatic notch on each side; the os coccygis, however, must remain *in situ*, as it is very material to the description of the Levator Ani muscle. Care must also be taken not to injure the rectum in these sections.

Begin by raising the peritoneum from the anterior surface of the rectum, after which, by letting the rectum fall backwards and putting the raised peritoneum on the stretch, an excellent view is obtained of the line of attachment of the latter to the lower part of the bladder. It will now be seen that the peritoneum is reflected from the bladder at the posterior end of the vesiculæ seminales, but that a pouch or process of it is sent down between them, which reaches to a short distance from the prostate gland, and that below this process of the peritoneum a very small space of the bladder lies naked, which can be punctured from the rectum, without injuring either the cavity of the peritoneum or the vesiculæ seminales. The upper margin of this pouch, next to the bladder, forms a strong horizontal doubling, which stretches across the pelvis, when the rectum is empty.

By distending the bladder moderately, the different reflections of the peritoneum from it to the abdominal parietes, and to those of the pelvis, will be better understood, and the possibility of puncturing the former above the pubes, without getting into the cavity of the abdomen, will be demonstrated fully, as well as the freedom with which its neck may be divided, in the lateral operation for the stone.

Next, strip the peritoneum from the sides of the pelvis, which will bring into view the Aponeurosis Pelvica connecting the bladder to the sides of the innominata. "This fascia descends from the ilio-pectineal line, to about midway in the depth of the pelvis; here it is reflected from the surface of the muscle (the Levator Ani) and applies itself to the prostate gland and bladder, on the body of which it is ultimately lost. At the angle of its reflection, this fascia appears particularly strong and white, but becomes more weak and thin as it lines the muscles and covers the bladder. In tracing this membrane, it will be seen that, from the pubes just below the symphysis, a pointed production of it constituting its anterior margin is fixed into the side of the neck of the bladder. This pointed production on each side, is called, by most anatomists, the Anterior Ligament of the bladder. Between the two, just beneath the symphysis of the pubes, a pouch, large enough to receive the end of the finger, is formed by the union of the fasciæ of the two sides; this pouch connects the middle anterior part of the neck of the bladder to the lower margin of the symphysis pubis."

A good account of this fascia was published by M. Breschet.* He says: "That when the aponeurosis which covers the iliac fossa arrives at the internal margin of the iliacus internus and psoas magnus muscles, near the superior strait of the pelvis, it plunges into this cavity in order to line its sides, and to cover the muscles which are applied on its several openings. Having got very low down, it embraces the rectum, is reflected upon the bas-fond of the bladder, the prostate gland, and in woman upon the vagina. From which cause, these viscera may be said to be in part in the cavity of the pelvis, and partly out of it, if we consider this cavity as the space on the outside of the aponeurosis. Some practitioners have observed that the consequences of the operation of lithotomy are different when the instrument penetrates more or less deeply behind or on the side. Inflammations, suppurations, abscesses in the cavity of the pelvis occur, when the instrument is thrust in too much, while no such accidents follow an instrument introduced moderately deep. Some distinguished practitioners† have asked the reason of these differences, and I believe that I have found them in the arrangement of the aponeurosis pelvica. If the instrument does not penetrate beyond this fascia, there is no abscess in the pelvis, or if a small quantity of pus be formed, it readily

* Thesis on Hernia, p. 310, presented to the Faculty of Medicine in Paris, for the place of Chef des Travaux Anatomiques, in the year 1819.

† Scarpa's Memoir on Hawkin's Gorget.

finds an issue externally. On the contrary, if the pelvic aponeurosis be injured, inflammation develops itself, suppuration takes place beyond this aponeurotic barrier, the liquid cannot get out, and it makes ravages which sometimes cause the death of the patient."

This description of the aponeurosis pelvica is true, but rather too general; the most common condition of it is found to be as follows: It adheres closely to the periosteum of the pubes, between the upper margin of the thyroid foramen and the crista of the pubes; about the middle third of the linea innominata, it is obviously a continuous membrane with the iliac fascia, but behind this again, it arises from the remaining third of the linea innominata.

The portion of this fascia which Mr. Colles speaks of, as particularly strong and white, forms a bow, the concavity of which looks upwards, one end of the bow being fastened to the pubes above the foramen thyroideum, and the other end to the ischium above its spine. The perineal surface of this bow is an important point of the origin of the levator ani. Above the bow this fascia is very thin, for the fibres of the obturator internus can be readily seen through it.

At the bow this fascia divides into two laminæ, one having the course to the bladder and rectum indicated, the other covers the lower part of the obturator internus muscle and constitutes the obturator fascia. The levator ani is interposed between the laminæ. The aponeurosis pelvica, also forms a bow or semilunar edge in front of the sacral nerves. The triangular ligament and this fascia are so identified in forming the capsule of the prostate gland, that the latter in description may be referred either to the one or the other, or to both, according to the fancy of the describer.

The Levator Ani muscle is essentially connected with the aponeurosis pelvica. In order then to get a view of it, make a cut through the fascia, from the symphysis pubis backwards to the sciatic notch, about half an inch above the middle of the fascia. As the muscle is placed nearer to the perineum, the fascia must be turned down towards the bladder as low as possible, the upper surface of the muscle is thus exposed, and also the manner in which it may be said to arise, particularly at its posterior part, from the under or perineal surface of the fascia.

The Levator Ani muscle arises fleshy from the back of the pubes near its symphysis, and from near the superior margin of the foramen thyroideum, above the obturator internus muscle. It also arises from the aponeurosis pelvica, where this membrane is extended as a thickened semilunar cord, from the superior margin of the thyroid foramen to the spinous process of the ischium. This second part of the origin of the levator ani is defectively described in most books on anatomy. It is then seen to cross obliquely, as far as the spine of the ischium, that portion of the obturator internus which arises from the plane of the ischium.

From this extensive origin the fibres converge, descend backwards, and have three distinct places of insertion; the posterior fibres are inserted into the last two bones of the os coccygis; the middle, and by far the greater number, are inserted into the semicircumference of the rectum, between its longitudinal fibres and the circular fibres of the sphincter ani; and finally, the most anterior fibres pass obliquely downwards and backwards, on the side of the vesical end of the membranous part of the urethra, and on the side of the prostate gland, and are inserted into the common point of the perineal muscles. These insertions of the levator ani, to be well understood, must be studied both from the perineal and abdominal surfaces. The forepart of this muscle is by some of the English anatomists [Messrs. Wilson and Guthrie] called the Compressor Urethræ.*

It yet remains to speak more definitely of the TRIANGULAR LIGAMENT; it has been seen from the perineum, and is now to be viewed from the pelvis. Remove the anterior part of the levator ani; the ligament is then seen occupying the interval under the symphysis, and between the rami of the pubes and ischia. Its base or inferior edge is crescentic; and, half an inch above the base, is the

* Wilson's Anatomy, p. 198.

hole for the membranous part of the urethra. This hole is, in fact, not very distinct, for the triangular ligament is reflected backwards from its edges, along the membranous part of the urethra, which obscures the hole. The prostate gland also gets a ligamentous capsule from a continuation of this same reflection, and is thereby very firmly fixed in its place.

The edges of the triangular ligament, fastened to the side of the pubic arch, are continuous with the fascia covering the obturator internus muscle. The triangular ligament is a membrane consisting of two laminæ; the bulb of the urethra is fastened to the anterior lamina, and the prostate is fixed to the posterior lamina; between these laminæ above, is the inter-pubic ligament, and several bloodvessels derived from the vena ipsius penis.

Mr. Colles says: "If we attempt, in conformity to the custom of anatomical writers, to describe all these continuous fasciæ, which connect the bladder and urethra to the pubes, as productions of one and the same fascia, we might say that the triangular ligament, by its outer edges, is fixed into the rami of the pubes, and is there continuous with the ligament lining the obturator muscles; that the edge of the opening, for receiving the membranous portion of the urethra, is produced backward along the prostate, and, having ascended as high as the arch of the pubes, it there splits into two laminæ, one continuing its course over the upper surface of the gland and bladder, the other lining the upper portion of the levator ani."

The description of the fasciæ of the pelvis is one of the most difficult and perplexing in the whole range of anatomy, and the proof of it is that almost every writer on the subject considers the labors of his predecessors imperfect, and with a very laudable spirit, hoping to supply the defect, invites the attention of the profession to his improved views. [Hence we often hear of a Superficial middle and Deep Perinea Fascia, the latter being the Triangular Ligament as above described.—Ed.] Not joining in this conviction, of the insufficiency of preceding descriptions, and the consequent value of such as are offered as substitutes, I feel satisfied in drawing materials from Mr. Colles's excellent work, on Surgical Anatomy.

CHAPTER IV.

OF THE ORGANS IN THE FEMALE FOR THE GENERATION AND NOURISHMENT OF THE INFANT.

SECTION I.

OF THE FEMALE PELVIS.

THE viscera of the female pelvis should be first studied in their natural situations; they should then be removed, and dissected neatly for more satisfactory examination. The whole study may afterwards be concluded with a side view, as in the male subject.

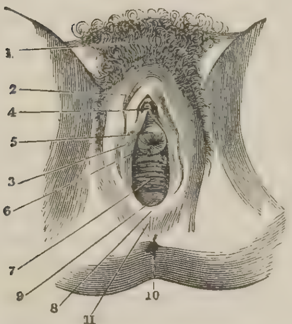
The FEMALE PELVIS contains the Urinary Bladder and Rectum, besides the Organs of Generation. The first two do not demand particular description here, as enough has been said concerning them in the account of the male pelvis. The Organs of Generation are situated between them, and consist of the Vulva externally, of the Vagina in the middle, and of the Uterus with its appendages internally.

Under the term VULVA we consider the most superficial of the copulative organs, as the Mons Veneris, the Labia Majora or Externa, the Labia Minora or Interna, the Clitoris, the Vestibulum, the orifice of the Urethra, the Fourchette, and the Fossa Navicularis.

§ 1. OF THE VULVA.

The MONS VENERIS is an eminence on the fore part of the pubes, which is produced by the deposit of a great quantity of fat under the skin. In very corpulent women its size is occasionally enormous. The skin covering it, at the age of puberty, is studded with hair, and under it is a considerable number of sebaceous glands, about the size and shape of millet-seed.

Fig. 34.
THE VULVA.



1. Mons Veneris.
2. Right Labium.
3. Right Nympha.
4. Clitoris, of which only the Anterior extremity is seen.
5. Vestibule.
6. Orifice of the Urethra.
7. Commencement of the Vagina.
8. Fourchette.
9. Navicularis Fossa.
10. The Anus.
11. Perineum.

The LABIA EXTERNA or MAJORA are oblong eminences, continued downwards and backwards, one on each side, from the mons veneris, and united with each other by the fourchette at the anterior part of the perineum. Their elevation is produced in the same way with the mons veneris, by a deposit of adipose matter beneath the skin or integuments; they are somewhat broader and more prominent above than below. On the side which is next to the thighs they are formed by the common skin, furnished sparingly with hairs; but on the internal face the integument is a mucous membrane, being a continuation of that of the Vagina. The skin here, as well as at the commencement of every mucous membrane, is insensibly changed into the latter. These bodies have many sebaceous glands externally, and mucous orifices internally on them. In their interior structure is found much cellular membrane, like that of the scrotum, possessed of great extensibility, in order to favor the dilatation of the parts in parturition. Between them is a longitudinal rima, about twice the length of the orifice of the vagina, for favoring still more the expulsion of the fœtus. It is the Fissura Vulvæ of authors.

The FOURCHETTE, or FRENULUM VULVÆ, is situated at the posterior commissure of the labia externa; it is a narrow transverse duplicature of skin; extending across the vulva from one side to the other, and is most frequently ruptured at the first parturition, and disappears. That portion of the rima betwixt it and the orifice of the urethra is called by many anatomists the Fossa Navicularis.

The CLITORIS is a small body situated between the upper extremities of the labia externa, on the lower part of the symphysis pubis, and corresponding in some respects with the penis of the male. It is furnished with a suspensory ligament, and curved towards the urethra. It consists of a body and of two crura; the body is about an inch long, and the crura, being of the same length, arise from the internal faces of the crura of the pubes. It is covered by an elastic ligamentous membrane; has an internal spongy body capable of erection like the penis, divided by a septum pectiniforme, and having a similar supply of bloodvessels and of nerves. It has also an erector clitoridis muscle lying upon each crus, and extended to the side of its body, in the same way with the erector penis.

The extremity of the body of the clitoris projects into the upper part of the bottom of the rima vulvæ, and is called its Glans, but does not resemble in structure the glans penis. A kind of hood is thrown over it by a duplicature of the integuments of the part, which giving some resemblance to the penis, it is therefore called the Prepuce (Preputium). This prepuce is occasionally much elongated and its orifice constricted, so that the secretion from its cryptæ is imperfectly discharged, and produces much itching and irritation. Mr. Marjolin relates the case of a Spanish girl of four years, in whom he performed circumcision successfully, in order to free her of a very bad habit to which she was addicted in consequence of this disease.

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The LABIA INTERNA, or NYMPHÆ, are two duplicatures of the mucous membrane of the vulva passing downwards, one from each side of the clitoris. The prepuce of the latter terminates on either side in the labia; while the latter are continued upwards by a narrow process to the under surface of the glans clitoridis. They arise all along their base from the internal sides of the labia majora, are seldom so broad naturally as to project beyond them, and are wider in the middle than elsewhere; they terminate insensibly about half-way down the orifice of the vagina. They consist of a duplicature of the mucous membrane of the part, between the laminæ of which is placed a vascular cellular membrane, giving to them, when excited, a somewhat erected condition. In young subjects, their vascularity communicates a vermilion tint, which is lost in the progress of life. They are supposed to direct in some measure the stream of urine; but it is more probable that, as they are effaced during parturition, they are intended to facilitate the enlargement of the vulvæ.

The VESTIBULUM is a depression of twelve or fifteen lines in length, at the upper part of the rima, bounded by the clitoris above, and the nymphæ laterally; in it are many mucous follicles.

At the inferior part of the vestibulum, about an inch below the glans clitoridis, is the Orifice of the Urethra (Orificium Urethræ). It is generally marked by a slight rising or tubercle, which is easily distinguished by the sensation of touch alone; its margin is often bounded by a little caruncle on each side. The URETHRA itself is an inch long, larger and much more dilatable than that of the male; its course is obliquely downwards and forwards from the neck of the bladder; passing under the symphysis of the pubis, and being slightly curved from that cause. It consists of two membranes, a lining and an external one. The lining membrane is a continuation of that of the bladder; is thrown into several longitudinal folds, and has many mucous follicles in it. The external coat of the urethra consists of condensed laminated cellular membrane, forming a cylindrical body of half an inch in its transverse diameter, which has given the idea of the existence of a prostate gland in the female. The lower and lateral surfaces of this cylinder are in contact with the vagina, forming a protuberance into its cavity, and the upper surface is firmly connected to the triangular ligament of the pubes.

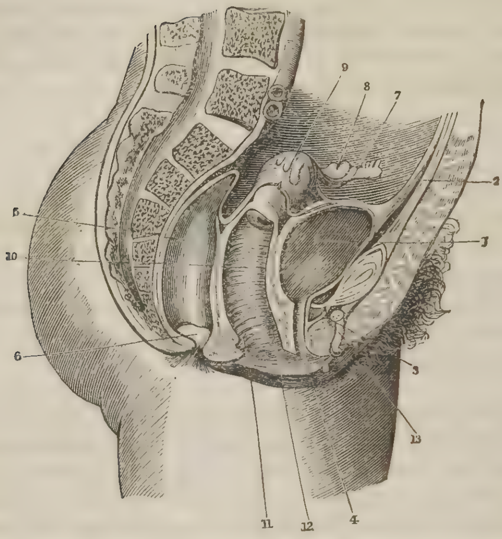
§ 2. OF THE VAGINA.

The VAGINA is the intermediate part of the sexual organs, and extends from the vulva to the Uterus, being placed between the Bladder and Rectum, and compressed anteriorly and posteriorly by them. In virgins, its external extremity is contracted into a smaller canal than the internal, and besides this, is closed by a membrane called the Hymen.

The HYMEN, situated just within the orifice of the vagina, is a partial septum formed by a reflection or duplicature of its lining membrane; it varies very much in shape, breadth, and thickness. Most commonly it is crescentic and fixed to the inferior part of the vaginal orifice by its convex edge, the horns being upwards; in other cases it is to the side. Sometimes it is a circular membrane, having a hole in the centre for the passing of mucus and menstrual blood. Being simply a duplicature of the mucous membrane, it is generally so weak that it is ruptured at the first act of copulation, or by slight causes during infancy, but occasionally it is so resisting that it has required artificial division to make it yield even to the expulsive efforts of the uterus in parturition. Its presence, then, is not invariably a proof of virginity, nor is its absence a proof of improper indulgence.

The VAGINA is a membranous canal of from four to six inches in length, differing according to age and pregnancy, being much shorter in women who have borne children than in virgins. Its shape varies somewhat; near the vulva, its greatest diameter is vertical, but behind, near the uterus, the greatest diameter is transverse. Its anterior and posterior surfaces are in contact from the circumstances just mentioned, of pressure between the

Fig. 35.



Left Half of a Vertical Section of the Female Pelvis, with the Rectum, Vaginà, and Bladder laid open, and the Uterus turned to the Left Side.

1. Bladder.
2. Urachus.
3. Anterior Ligament of the Bladder.
4. Urethra.
5. Rectum.
6. Transverse Folds or Pouches of the Rectum.
7. Left Fallopian tube.
8. Left Ovary.
9. Uterus.
10. Vagina.
11, 12. Anterior and Posterior Vertical Bands or Pillars of the Vagina.
13. Clitoris.

bladder and the rectum. It is shorter before than behind, corresponding in this respect with the pelvis by which it is influenced, and also, in consequence of being attached to the uterus, higher up on the sacral than on the pubic side.

It consists of two coats, a fibrous and elastic one externally, and a mucous one internally. The first is of a reddish color, and seems to be formed of condensed cellular membrane, its fibres not passing in any determinate direction. Many bloodvessels are found in its structure, and it has an abundance of large venus sinuses surrounding it.

On the anterior part of this coat externally, there is an erectile tissue (Corpus Spongiosum Vaginæ), about one inch broad and a line or two thick, which is placed on its superior and lateral surfaces, covering about one-half or two-thirds of the whole circumference of the vagina. The structure of this body closely resembles that of the corpus spongiosum urethræ, and, from being very vascular, is subject to distension in its cells during sexual excitement. It is frequently called the Plexus Retiformis, and is covered by the sphincter vaginæ muscle.

The Sphincter Vaginæ arises from the body of the clitoris and the crus pubis; forms an expanse of an inch and a quarter around the anterior end of the vagina; and is inserted into a dense whitish substance in the centre of the perineum, common to it, the sphincter ani, and the transversi perinei muscles.

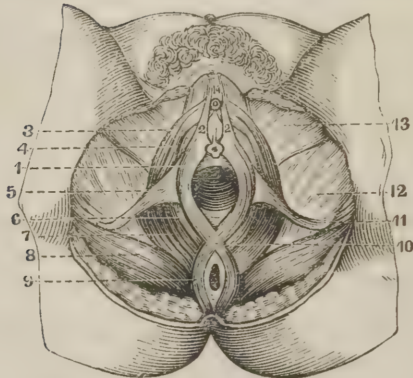
The transverse perinei muscles exist in the female, and have the same circumstances of origin and insertion, but are not so strong as in the male.

Anterior to the corpus spongiosum on each side of the vagina, near its middle, is frequently a mucous gland about the size of a garden pea, which corresponds with Cowper's gland in the male.

To bring into view satisfactorily the internal membrane of the vagina, the canal should be slit up laterally, from its external orifice to the uterus; this membrane being mucous, will then be observed as continuous with the mucous membranes of the vulva and uterus. Near the vulva it is of a vermilion tinge, but near the uterus it is grayish, with several dark spots, giving it a marbled appearance; its thickness diminishes as it recedes from the external orifice.

In females in whom the hymen is ruptured, its remains consist in from two to six small tubercles, the Carunculæ Myrtiformes. On its anterior or pubic wall, the internal surface of the vagina is divided longitudinally by a ridge, commencing in a sort of tubercle, at the anterior orifice of the vagina, just under the meatus urinarius; this ridge

Fig. 36.



MUSCLES OF THE FEMALE PERINEUM.

1, 2, 6. Sphincter Vaginæ Muscle.
3, 4. Erector Clitoridis "
5, 11. Transversus Perinæi "
7. Levator Ani "
8. Gluteus Maximus "
9. Sphincter Ani "
10. Junction of the Sphincter Ani and Sphincter Vaginæ Muscles.
12. Adductor Magnus.
13. Gracilis.

proceeds backwards, but becomes indistinct in approaching the uterus; from it on each side proceed transverse ridges or folds of the mucous membrane, which are particularly numerous and prominent before, but become indistinct and irregular near the uterus. The inferior side of the vagina has the same sort of arrangement as the superior, only not so well marked.

By cleaning the vagina, and suspending it in water, an abundance of mucous cryptæ may be observed on its whole internal surface, which, by an increased discharge, produce leucorrhœa.

The peritoneum, in descending from the uterus anteriorly, touches the top of the vagina for a little distance, and is then reflected to the bladder, but posteriorly, nearly the upper half of the vagina has a peritoneal coat, before this membrane is reflected to the rectum. The attachment of the vagina to the bladder is strong and close just about the urethra, but its connection to the rectum is by rather loose cellular membrane.

§ 3. THE UTERUS AND ITS APPENDAGES, THE FALLOPIAN TUBES AND OVARIA.

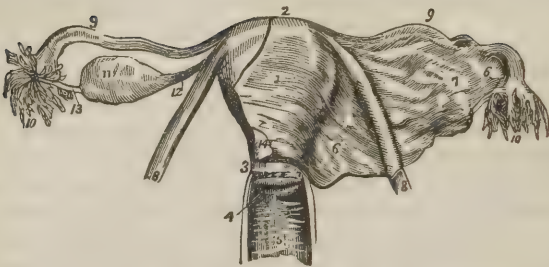
The UTERUS is a compressed pyriform body with a cavity in its centre, placed between the bladder and rectum, has the small intestines above it, and the vagina below. Unimpregnated, it is two inches and a half long, and an inch and a half wide at its broadest part, about one inch thick and much flatter on its anterior than on the posterior surface. It is divided by anatomists into Fundus, Body, and Neck. The fundus is the superior convex edge, between the orifices of the Fallopian Tubes; the neck, the narrow cylindrical part about an inch long below, and the body, the portion between these two.

The Uterus is maintained in its situation in the centre of the pelvis, by the reflections of the peritoneum, which are called ligaments. The peritoneum, after covering the uterus completely, is reflected anteriorly upon the vagina, and at each side of this reflection is a fugitive duplicature of the membrane, denominated the Anterior Ligament, which goes to the bladder. The peritoneum, in passing from the back part of the uterus to the vagina and subsequently to the rectum, has on each side of this reflection also a duplicature, which constitutes the Posterior Ligament. The peritoneum is also reflected from the whole length of each side of the uterus, to the corresponding part of the cavity of the pelvis; these reflections are termed the LATERAL OR THE BROAD LIGAMENTS. The peritoneum covers much more of the vagina posteriorly than it does anteriorly.

These Broad Ligaments, with the uterus, form a transverse septum in the middle of the pelvis. At the superior edge of this septum, on each side, is the Fallopian Tube, and on the posterior face of the septum, below the edge, and about an inch or a little more from the uterus, on each side, is an Ovarium. The peritoneum adheres to the uterus by a cellular tissue, which is somewhat loose and can be easily dissected from it.

Besides the ligaments mentioned, the uterus has two more, one on each side, called the ROUND LIGAMENTS. They arise from the side of its body, between the dupli-

Fig. 37.



Anterior View of the Uterus and its Appendages.

1. Body of the Uterus.
2. Its Superior Border or Fundus.
3. Its Neck (Cervix).
4. Its Mouth (Os Uteri).
5. The Vagina.

6, 6. Broad Ligament formed by the Peritoneum, which has been removed from the Opposite Side.

7. Prominence formed by the Subjacent Ovary.

8, 8. The Round Ligaments, cut where they enter the Internal Inguinal Ring.

9, 9. Fallopian Tubes.

10, 10. Their Fimbriated Extremities—on the Left Side the Extremity of the Tube is turned forward, to show its Mouth or Abdominal Orifice.

11. The Ovary.
12. The Utero-Ovarian or Broad Ligament.
13. One of the Processes of the Fimbriated Extremity of the Tube connected to the Ovary.
14. Cut Edge of the Peritoneum on the Anterior Surface of the Uterus—this Membrane is represented here as descending rather lower upon the organ than is really the case.

catures of the broad ligaments, and pass under the peritoneum to the abdominal ring, through which they penetrate, and are lost upon the fat of the mons veneris and of the labia majora. They are of a condensed cellular or fibrous structure, and have many bloodvessels in them.

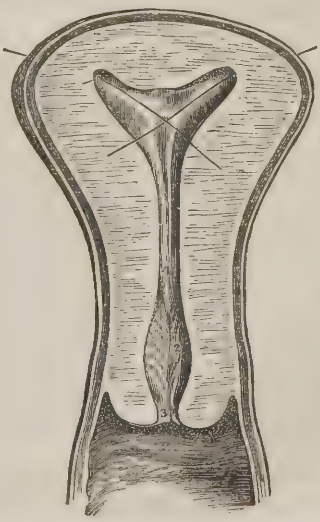
The neck of the uterus is inclosed by the cavity of the vagina, in such a way that it projects into the latter. In the centre of this projection is the Orifice of the Uterus (Os Tincæ), which is not perfectly cylindrical, but somewhat flattened or oval; this orifice is bounded before and behind by the lips or projections of the neck, which are transverse. The posterior lip is somewhat thinner than the anterior, but, in consequence of the insertion of the vagina on that side being higher up, it projects more into the vagina, and is easily distinguished by the finger.

Behind the os tincæ is the Cavity of the Neck, which is a paraboloid cylinder, larger in the middle than at either end; its termination forwards is about the size of a small writing-quill, the posterior extremity is somewhat larger. In the middle of this cavity, before and behind, longitudinally, is a line formed by an elevation of the lining membrane, and on each side of this line, transversely or obliquely, there are others presenting an arborescent arrangement. This is the Arbor Vitæ. In the interstices of the transverse lines, there are small mucous glands called Ovula Nabothi, in consequence of this anatomists mistaking them for eggs.

The cavity of the body of the uterus is triangular, the sides of the triangle being curved inwards, so as to present their convexities to its cavity. The cavity is nearly

Fig. 38.

Transverse Section of the Uterus, and Part of the Vagina.



1. Cavity of the Body.
2. Cavity of the Neck, its walls marked by fine oblique ridges.
3. Cervico-Vaginal Orifice (Os Uteri).
4. Cervico-Uterine Orifice. The two bristles are introduced through the Orifices of the Fallopian Tubes.

equilateral, and has its anterior and posterior surfaces in contact; the angle below is continued into the cavity of the neck, and the angles above are continuous with the Fallopian tubes, being extended very far through the parietes of the uterus, in order to meet them. This cavity is sometimes divided into two symmetrical halves, by an elevated line on its anterior and posterior surface, running from above downwards. It is said that, in some cases, they have had a complete partition.

The internal membrane of the uterus is a continuation of that of the vagina, and adheres so closely that its existence has been doubted. It has very little thickness, is extremely smooth, and presents villosities so fine that they are seen with difficulty by the naked eye. It is of a light pink color, which changes into a deeper vermilion a few days before and during menstruation. It abounds with mucous cryptæ and exhalant orifices.

The texture of the uterus is essentially fibrous, and of a white color tinged with red, from having a great number of bloodvessels in its composition. The fibres have no determinate course, but are blended and interwoven in every direction. Its muscularity is not apparent in the unimpregnated state.

The Fallopian Tubes (Tubæ Fallopianæ) are two membranous canals fixed, as mentioned, in the upper edges of the broad ligaments. They are about four inches long, somewhat serpentine, and extend from the upper angles of the uterine cavity to the sides of the pelvis. At their uterine extremities these tubes scarcely admit a hog's bristle, but as they proceed externally, about halfway of their length, they begin to increase, and continue to do so very rapidly almost to their termination, where they become somewhat contracted, and immediately afterwards enlarge, to end by an oblique trumpet-shaped mouth, singularly fringed, called Morsus Diaboli, or Corpus Fimbriatum. This latter part of the tube is loose and pendulous, overhanging the ovarium on the back part of the broad ligament.

The Fallopian Tube seems to be a continuation of the structure of the uterus, having a fibrous membrane externally, and an internal mucous one; the latter is principally concerned in forming its large extremity, and is rendered erectile in sexual excitement, probably by its great vascularity.

The OVARIES (Ovaria, Testes Muliebres) are situated one on each side of the uterus, and on the posterior face of the broad ligament, inclosed in a duplicature of it. They are compressed ovoids about half the size of the testicle, of a very light pink color; are connected to the uterus by a small, vascular, and fibrous cord, called Ligament of the Ovary, which is inserted into the uterus just below the Fallopian tube. The external end of the ovary has one of the processes of the corpus fimbriatum or morsus diaboli adhering to it.

The surface of the ovary is generally found somewhat uneven, from a number of marks resembling cicatrices. It has a complete peritoneal coat, and within this is another of a strong, compact, fibrous character, sending many processes internally, and which is the Tunica Albuginea.

The structure of this body is as follows: When the ovary of a healthy female (different from those usually found in our dissecting rooms, who, from disease or excessive sexual indulgence, do not present the organ in its normal condition) is examined by cutting through the Tunica Albuginea, the organ is found to consist of a spongy fibrous tissue, abundantly furnished with bloodvessels from the spermatic artery and vein. In this spongy tissue, called Stroma, are from fifteen to twenty or more spherical vesicles (Ovula Graafiana), according to the commonly received opinion. They vary in size from half a line to three lines in diameter; the larger ones are nearer the surface, and, from having caused the absorption of the tunica albuginea, may sometimes be seen through the peritoneal coat, and give to the surface of the ovarium an embossed condition. These vesicles contain a transparent fluid, having within it the rudiments of the embryo. As the vesicles are evolved, they advance from the centre to the circumference. Their parietes are thin, transparent, and have creeping through them minute arterial and venous ramifications. The bed of the ovarium, in which a vesicle reposes, is called the Calyx.

To Von Baer belongs the merit of discerning first the Ovulum of man and mammalia, in the Graafian Vesicle. This ovulum occupies but a very small part of the cavity of the Graafian vesicle, the remainder being filled with an albuminous fluid, in which microscopic granules float. By discharging the fluid from a Graafian vesicle, the ovulum can, with a simple lens, be detected in a globular form and floating in this fluid. A very remarkable point mentioned by Carus, is, that all the essential parts of the ovulum can be detected in the ovary of the mature human embryo, or in that of mammiferous animals; hence the preparation for new generation seems to begin at a very early period of life. Upon the escape of the contents of a Graafian vesicle, the latter is first filled with coagulating lymph or blood, which being, after a time, absorbed, the vesicle collapses and shrivels, and the stigma then remains permanently as a stellated cicatrix (Corpus Luteum). Sometimes the entire surface of the ovaruim is marked with them.

The Bladder and Rectum, with unimportant exceptions, are the same in both sexes. The arteries of the viscera of the pelvis, in both cases, are derived from the internal iliacs.

The Levator Ani, Coccygeus, and Sphincter Ani muscles have the same arrangement as in males.

The Fasciæ connecting the bladder to the sides of the pelvis, and the triangular ligament of the urethra, also exist.

SECTION II.

OF THE FEMALE MAMMÆ.

The Mammary Gland, though belonging to the anatomy of the Thorax, may be well considered here in connection with the organs of reproduction.

The Mammæ are two glandular bodies, situated over the thorax, upon the great pectoral muscles, between the armpits and the sternum, and intended, in the female, for the secretion of milk. They are hemispherical, and vary much in size, according to the age of the person and the state of the uterine system.

The skin which covers the mamma is very fine and thin, and through it may be seen readily the veins which creep beneath it. It is very extensible, but does not possess much power of contraction. Beneath the skin, between it and the surface of the gland, there is an abundance of cellular substance intermixed with lobules of fat, which, together, make a greater volume of matter than the gland itself. The exterior surface of the gland is rendered very unequal, by being penetrated at different depths by this cellular and adipose matter; and its lobules are divided by irregular fossæ from each other. The substance of the gland is united to the pectoralis major muscle, by a loose cellular tissue, which contains very little fat.

The mamma is composed of Lobes of different sizes, united together in such a way, by cellular texture, that they cannot be separated without injury to them. These lobes are composed of Lobuli, which again are formed by granuli of a white color tinged with red. These granuli are the size of a millet-seed, and, according to some anatomists, consist of vesicles, which are very apparent by the aid of a microscope, in a gland filled with milk.*

The roots of the excretory vessels, or the lactiferous ducts, arise from these granules; they are extremely fine, and unite after a short course to contiguous ones, by successive accumulations resembling the branches of a tree; large trunks are finally formed, which terminate in still larger, placed in the centre of the gland near the base of the nipple. All the lactiferous ducts converge from the circumference of the gland, to its centre; their course, however, is very tortuous, and their coats are thin, semitransparent, and very capable of extension and contraction. These ducts are numerous, and from two to four of them unite into a common trunk, called the Lactiferous Sinus, which is only a few lines long, and placed near the base

* See Marjolin, vol. ii. p. 295.

of the nipple. These sinuses are about fifteen in number, are of different diameters, the largest being about three lines wide, though others scarcely exceed the diameter of the lactiferous tubes. From the extremity of each sinus arises a small excretory duct, which conducts the milk to the summit of the nipple. This duct is of a conical shape, sometimes dilated in its middle, and is curved and folded upon itself, when the nipple is not in a state of erection, by which means the milk is prevented from flowing through it. The sinuses, and these ducts, are united together by condensed cellular membrane; they have no valves, neither have the lactiferous tubes in any part of their course.

An opinion was entertained by Haller, and by many other anatomists after him, that some of the lactiferous ducts originated in the surrounding cellular texture; this has been refuted by the researches of Cuboli. The excretory ducts of the different lobes are for the most part kept distinct from each other, there being no anastomoses between them; hence it happens that in the injection of the gland with mercury it is necessary to inject each milk-duct of the nipple separately. Some anatomists have thought that there is a direct communication between the roots of the lactiferous tubes and the arteries, veins, and lymphatics. Mascagni, after a very successful injection of the gland, in which he filled its vesicles with quicksilver, not meeting with such an occurrence, was induced to think that, when such communication did happen, it was by rupture.

The Areola in virgins is a rose-colored circle, which surrounds the base of the papilla or nipple. In women who have borne children, or in those whose age is advanced, it becomes of a dark brown. The skin of the areola is extremely delicate, and on its surface, particularly in pregnant or nursing females, there are from four to ten tubercles, which sometimes form a regular circle near its circumference, and in other subjects are irregularly distributed. Each of these tubercles has near its summit three or four foramina, which are the orifices of the excretory ducts of a little gland forming the tubercle.

From this gland is secreted, according to some, an unctuous fluid for protecting the surface of the areola, while others consider it only as lactescent. The areola consists of a spongy tissue, beneath which there is no fat; it is susceptible of distension during lactation, or from sexual excitement.

The PAPILLA or NIPPLE is the truncated cone in the centre of the mamma, of the same color with the areola, and surrounded by it. The milk-ducts all terminate on its upper end. It is collapsed, and in a very pliable state, for the most part, but when excited it swells, becomes more prominent, and of a deeper color. Its skin is rough, and provided with numerous and very small papillæ. Its internal structure consists merely of the milk-ducts, united by condensed cellular membrane.

Fig. 39.

LACTIFEROUS DUCT OF THE MAMMARY GLAND.

1. Apex of the Nipple.
2, 2, 2. Straight Lactiferous Ducts of the Nipple.
3. Sac-like Dilatation of the Ducts at the Base of the Nipple.
4, 4. Origin of the Ducts in the Substance of the Gland.

The mamma is supplied with blood from the external thoracic, intercostal, and internal mammary arteries. Its veins attend their respective arteries. The nerves come from the brachial plexus and the intercostals. Its lymphatics run into the internal mammary and axillary trunks.

CHAPTER V.

OF THE THORAX.

Before proceeding to the examination of the cavity of the Thorax, the student should carefully dissect the muscles which lie upon its front part and sides, [which may be readily accomplished by making an incision in the median line, through the skin and superficial fascia of the thorax, from the top to near the lower bone of the sternum, and then carrying another from the commencement of this one along the curve of the clavicle to the acromion process of the scapula, turning the flap outwards over the shoulder and arm. By keeping the flap tense, and cutting close to the fibres of the muscle, the Pectoralis Major will be handsomely displayed.]

SECTION I.

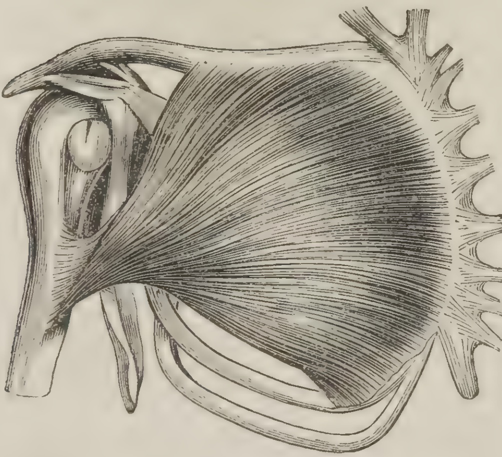
OF THE MUSCLES.

1. The Pectoralis Major is the most superficial of the muscles of the thorax, and forms the large swelling cushion of flesh under the skin of the breast. It arises tendinously from the anterior face of the two upper bones of the sternum their whole length, fleshy from the cartilages of the fifth and sixth ribs, and by a fleshy slip from the upper part of the tendon of the external oblique muscle. It arises also fleshy from the interior two-thirds of the clavicle. The clavicular and sternal portions of its origin are separated by an interval, which give it the appearance of two muscles.

The fibres converge, and terminate by a broad, thin tendon, which is inserted into a roughness on the exterior edge of the bicipital fossa of the os humeri, and into the brachial fascia, just at the internal edge of the deltoid muscle. The under edge of the muscle, near its insertion, is folded inwards, which gives the rounded thick margin to the fore part of the axilla. That part of the broad tendon belonging to the clavicular portion of the muscle is inserted lower down than the sternal, which produces a decussation of the fibres of the tendon.

The Pectoralis Major draws the arm inwards and forwards, and also depresses it when raised.

Fig. 40.

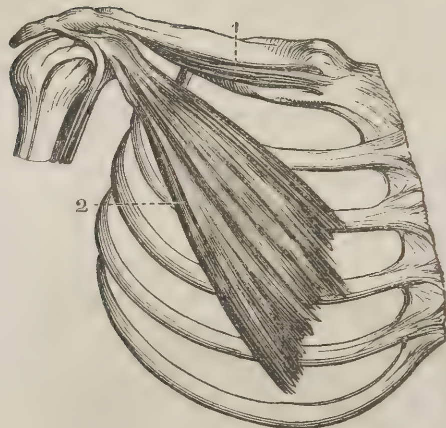


FRONT VIEW OF THE PECTORALIS MAJOR MUSCLE.

2. The PECTORALIS MINOR is brought into view by raising the last muscle. It is comparatively small and somewhat triangular, arising by thin tendinous digitations from the upper edges of the third, fourth, and fifth ribs. It soon becomes fleshy, and is inserted, by a short flat tendon, into the inner face of the coracoid process of the scapula. Its use is to draw the scapula inwards and downwards.

3. The SUBCLAVIUS is a small muscle placed immediately under the clavicle. It arises from the cartilage of the first

Fig. 41:



A Front View of the Subclavius and Pectoralis Minor Muscles.

1. Subclavius. 2. Pectoralis Minor.

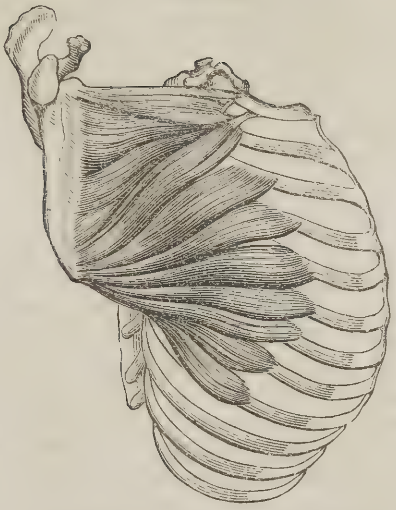
rib, and is inserted into the inferior face of the clavicle, from near the sternum to the conoid ligament, which connects the coracoid process and the clavicle together. It draws the clavicle downwards.

4. The Serratus Major Anticus is a broad muscle lying on the sides of the ribs, between them and the scapula, and beginning at a line anterior to their middle. In well-defined bones, the precise points of origin are readily seen. It arises from the nine upper ribs by fleshy digitations, the superior one of which seems almost like a distinct muscle; the five lower are connected to the obliquus externus abdominis, the digitations of the two muscles interlocking with each other.

The fibres converge, and are inserted into the base of the scapula its whole length. Its action is to draw the scapula forwards.

5. The Intercostales fill up the spaces between the

Fig. 42.



The Serratus Major Anticus Muscle.

ribs. There are two in each space, of which the External arises from the transverse process of the vertebra, and from the inferior acute edge of each rib, from its head almost to its cartilage, and is inserted into the superior rounded edge of the rib below, for the same distance, its fibres passing obliquely forwards. The Internal intercostal, arises from the inferior edge of the rib and costal cartilage, beginning at the sternum, and extends backwards to the angle of the rib; it is inserted into the superior rounded edge of the rib and costal cartilage below, on its inner side, its fibres passing obliquely backwards and downwards. They draw the ribs together.

In order to examine the cavity of the thorax, the sternum along with the cartilages of the ribs should now be taken out, by cutting through the costal cartilages, and turning the piece up on the front of the neck, when we shall see, on its posterior face, a muscle called the Triangularis Sterni.

6. The Triangularis Sterni Muscle arises from the

whole length of the cartilago ensiformis at its edge, and from the inferior half of the edge of the second bone of the sternum. The fibres go obliquely upwards and outwards, to be inserted into the cartilages of the third, fourth, fifth, and sixth ribs, by fleshy and tendinous digitations. Its use is to depress the ribs, and consequently to diminish the cavity of the thorax.

SECTION II.

OF THE VISCERA OF THE THORAX.

Although the usual manner of getting into the cavity of the Thorax is that just mentioned, there is a much better one introduced in Philadelphia, by the late Professor Wistar, in which the five middle true ribs on each side are removed by sawing through them, all the rest of the ribs with the sternum being left. This plan gives an excellent view of the several viscera, and also of their relative situation and extent; and is such as I would recommend the student to adopt, in at least one dissection. The principal objection to it is, that it renders the upper parts of the trunk unfit for farther investigation, inasmuch as the superior extremities must be removed in the first place. If the muscles connecting the upper extremities to the trunk, on its fore and back parts, should have been previously dissected, and the student does not wish to preserve the skeleton of his subject, this objection will no longer be valid.

Approaching the cavity of the thorax, by either of the methods mentioned, we see at once its most striking contents, viz. the Heart and Lungs, each covered by an appropriate membrane. The heart is between the sternum and the dorsal vertebræ; the lungs are on each side of it, and, when in a healthy state, always collapse upon the thorax being opened.

§ 1. OF THE PLEURÆ.

Each of the two lungs has a perfect serous membrane called Pleura, which covers its external surface; and, giving it a glistening smooth appearance, is reflected from the internal face of the lung, over the side of the pericardium, to the sternum before, and to the spine behind. This membrane also lines the ribs, intercostal muscles, and diaphragm of that side of the thorax to which it belongs. Above, it passes up as high as the head of the first rib, and below, it goes as low down as the last rib. That part of the pleura which covers the lung, is the Pleura Pulmonalis; that which lines the ribs, the Pleura Costalis; and that covering the Diaphragm, the Pleura Diaphragmaticus.

As the pleuræ are bags, like other serous membranes, and each one is a perfect sac, and as there is one on each side of the thorax, it is very demonstrable, that their opposing faces form a septum, which extends from the sternum in front to the spine behind, and from the upper part of the thorax to the diaphragm. This septum is the Mediastinum, and the heart is placed in its middle. The portion of the septum between the heart and sternum is the Anterior Mediastinum; that between the heart and spine is the Posterior Mediastinum, and that between the heart and the upper part of the thorax is the Superior Mediastinum; each of which merits strict attention.

It is obvious, then, that the septum consists of two laminæ, one from each pleura. These two laminæ are somewhat separated, where they are called the Anterior Mediastinum, by the remains of the thymus gland above, and by adipose and cellular membrane below. The anterior mediastinum is attached to the middle of the sternum, except at its lower part, where it inclines somewhat to the left side. To get a good view of its contents, the sternum must be sawed through longitudinally, and the two halves separated an inch, by a small block of wood. The contents of the posterior mediastinum and of the superior, are best seen and understood at a subsequent stage of the dissection.

The PLEURA is a thin and transparent serous membrane, connected to the parts on which it lies, by a short cellular substance. No red vessels, in its healthy state, are to be observed in it. In the young subject, it is free from adeps;

but in advanced life, attended with corpulency, considerable masses of fat are found in the anterior mediastinum, and between it and the pericardium. The exhalent vessels of the pleura are derived from the intercostal, internal mammary, phrenic, and some other arteries, and secrete a fluid which lubricates its surface.

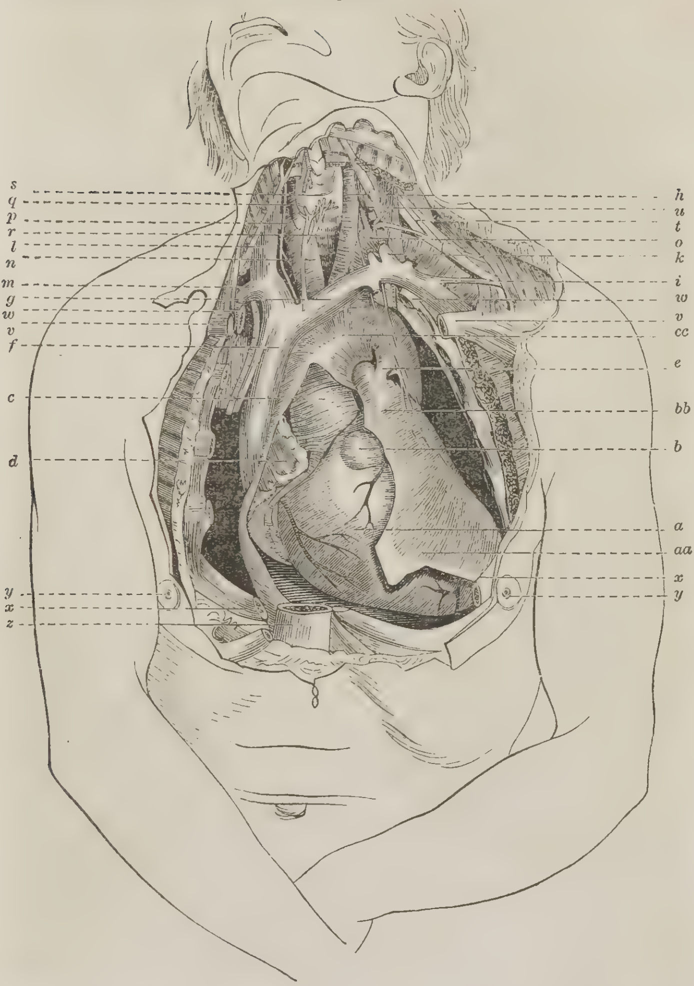
§ 2. OF THE PERICARDIUM.

Between the pleuræ, under the sternum, and reposing on the tendinous centre of the Diaphragm, to which it adheres by close cellular substance, is the PERICARDIUM, containing the heart. It is a white, semitransparent, double membrane, of a condensed fibrous structure, externally, and possessed of little or no elasticity, which renders it highly appropriate for sustaining the action of the heart in its dilatations.

Internally, it is lined by a serous lamina, which forms a complete bag, in being reflected over the surface of the heart, so as to give it an investing membrane. This investment commences at the back part or base of the heart, and is continued over the whole of it, being extended on the aorta to the branches which arise from the top of its curvature; on the pulmonary artery to its bifurcation; on the pulmonary veins to their first branches; on the ascending cava to the diaphragm; and on the descending cava to the middle of the space between the entrance of the vena azygos and the transverse vein. The exterior lamina has not these reflections, it is only united to the several parts where the reflections commence.

As an analogy with the membranes of the joints is observable in this arrangement, the exterior lamina of the pericardium corresponds with the capsular ligament, and the internal lamina with the synovial membrane. It is the exterior membrane which supports the heart, and the interior which furnishes the lubricating fluid, found generally in the pericardium, to the amount of a drachm. The fore part of the pericardium lies loosely on the heart. The pericardium is attached strongly, by all its inferior surface, to the tendon of the diaphragm.

Fig. 43.



a. Right Ventricle of the Heart.
a, a, and *b, b.* Pericardium.
b. Pulmonary Artery.
c, c. Arch of Aorta.
d. Right Auricle.

e. Fibrous Remains of the Ductus Arteriosus through which the Pulmonary Artery of the Fœtus communicated with the Aorta.

f. Superior Cava.
g. Left Brachio-Cephalic Vein.
h. Left Common Carotid Artery.
k. Lower End of the Left Internal Jugular Vein.
l. Right Jugular Vein.
m. Right Subclavian Vein.
n. Innominata or Brachio-Cephalic Artery.
o. Left Subclavian Artery.
p. Right Subclavian Artery crossed by the Pneumogastric Nerve.
q. Right Common Carotid Artery.
r. Trachea.
s. Thyroid Gland.
t. Brachial Plexus of Nerves.
u. Upper End of Left Internal Jugular Vein.
v, v. Clavicles cut across and displaced downward.
x, x. Fifth Ribs cut across.
y, y. Right and Left Breasts.
z. Lower End of the Sternum.

§ 3. OF THE HEART.

The Heart is a hollow muscular organ, consisting of four cavities, two Auricles and two Ventricles. Its shape is somewhat conoidal, but flattened on the under surface, which lies upon the diaphragm. The base of the cone is formed by the auricles, the body by the ventricles, and the apex by the anterior end of the left ventricle projecting beyond that of the right. The heart being fixed as mentioned, between the sternum and the dorsal vertebræ, has its base turned obliquely towards the right side, while its apex is about the junction of the fifth left rib with its cartilage. Its flat part reposing on the flat tendon in the centre of the diaphragm, is on a horizontal line, or nearly so, with the inferior end of the second bone of the sternum. The heart, in consequence of being tied down to the diaphragm by the pericardium, is, excepting in its pulsations, exposed to but little motion, and is therefore almost uniformly in the same position. It has, between the internal membrane of the pericardium and its own substance, more particularly along the course of the coronary vessels, adipose matter in great abundance in old subjects, and this adipose matter sometimes penetrates so deeply between the fasciculi of its fibres, as to give them a very loose texture, and apparently to disqualify them in some measure from performing their functions.

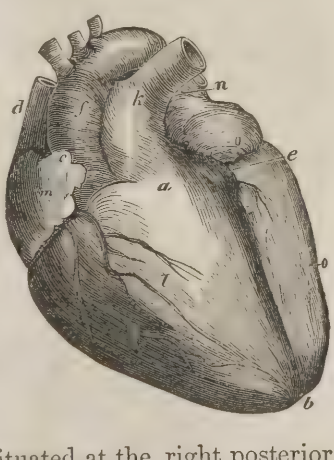
The parietes of the heart are formed principally of muscular fibres, which are variously arranged; some pass spirally around it, others in an irregular and indeterminate manner, but all in such a direction as to concur by contracting in effacing its cavities. The cavities are lined by a serous membrane, which is a continuation of, and resembles the internal coat of the arteries and veins. Between the auricles and ventricles, and at the orifices of the great arteries, this membrane is raised up and reflected so as to constitute valves.

The heart is divided into Right and Left sides, each consisting of an auricle and of a ventricle. The Right Auricle receives the two great trunks of the venous system, to wit, the Ascending and the Descending Vena Cava. The Left Auricle receives the Pulmonary Veins. The Right Ventricle sends off the Pulmonary Artery, and the Left Ventricle the Aorta.

Fig. 44.

FRONT OR UPPER SURFACE OF THE HEART AND GREAT VESSELS, INJECTED AND PLACED OBLIQUELY, BUT ITS APEX IS NOT TILTED FORWARD AS IN THE BODY.

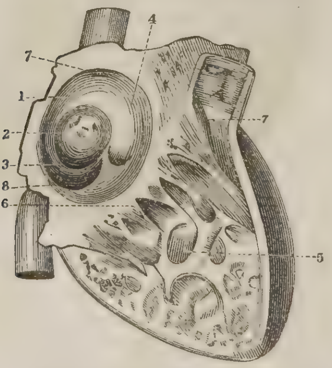
a. Infundibulum of Right Ventricle.
b. Notch at Apex of Heart.
c. Auricular Portion of Right Auricle.
d. Vena Cava Superior.
f. The Aorta.
e, b. Anterior Longitudinal Furrow, marking the Division between the Ventricles.
k. Pulmonary Artery.
l. Right Ventricle, of which the chief part is seen in front.
m. Right Auricle.
n. Left Auricle, seen only to a small extent, with its Appendage projecting forward.
There is another letter, *o*, on the Left Ventricle.



The RIGHT AURICLE is situated at the right posterior part of the heart, and is an oblong cuboidal cavity, about a line in thickness. To view its internal arrangement, it should be slit open in front from cava to cava; we shall then see that its posterior surface is smooth, and is formed by a continuation of the structure of the great veins, which meet each other at an obtuse angle, and form a projection into the auricles. This last circumstance, connected with a slight thickening of the part, has given it the name of Tuberculum Loweri. Anteriorly, the auricle is swelled into a pouch (Sinus Venosus), in which the muscular fibres, instead of being uniformly spread into a coat, are collected into transverse fasciculi, lying parallel to and near each other; they are called Musculi Pectinati, from their resemblance to the teeth of a comb. At the upper part of the pouch, or sinus, is the proper auricular portion of the cavity, resembling the ear of an animal, whence it got its name; it is not marked by any striking peculiarity, except that the musculi pectinati prevail in it. The auricles have a common septum, and on it, just below the Tuberculum Loweri, is situated the Fossa Ovalis, which in the fœtal state was an opening between the auricles, and, indeed, at the upper part of this depression, we often find a foramen large enough to admit a probe into the left auricle, even in subjects advanced into old age. The edges of the fossa ovalis are elevated and thickened, constituting the Annulus Ovalis, or Isthmus of Vieussens.

Fig. 45.

Right Wall of the Heart cut away to show the Interior of the Right Auricle and Ventricle.



1. Inter-Auricular Septum.
2. Fossa Ovalis.
3. Eustachian Valve.
4. Opening of the Coronary Vein.
5. Muscular Fasciculi of the Right Ventricle.
6. Tricuspid Valve.
7. Opening of the Superior Vena Cava.
8. Opening of the Inferior Vena Cava.

Just below the fossa ovalis, is the Eustachian Valve. It is formed by a duplicature of the lining membrane of the auricle and of the ascending cava, being spread somewhat obliquely across the orifice of the latter. It is of a crescentic shape, about half an inch wide, but occasionally reticulated, and commencing at the left side of the annulus ovalis, terminates anteriorly, about the junction of the auricle and the vein. It is connected by its convex edge to the parietes of the auricle, and its concave or floating edge looks somewhat upwards. Just before and below the Eustachian valve is another much smaller, but also semilunated, which is called the Valve of Thebesius. It covers the orifice of the great coronary vein.

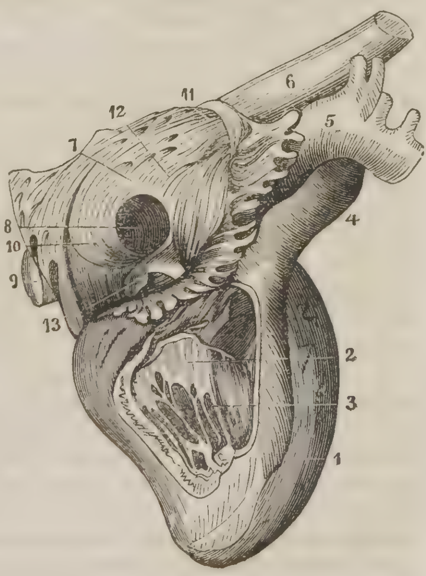
Between the right auricle and right ventricle is an opening of more than an inch in diameter, called the Ostium Venosum, through which the auricle communicates with the ventricle.

In the right auricle, are many small orifices of coronary veins named Foramina Thebesii; they also exist in

Fig. 46.

A View of the Interior of the Right Auricle and Right Ventricle.

1. The Right Ventricle.
2. Tricuspid Valve.
3. Chordæ Tendineæ.
4. Pulmonary Artery.
5. The Aorta.
6. Descending Vena Cava.
7. The Right Auricle.
8. Orifice of the ascending Vena Cava.
9. Vena Cava Ascendens.
10. Valvula Eustachii.
11. Orifice of the Descending Vena Cava.
12. Position of the Tuberculum Loweri.
13. Valvula Thebesii overhanging the orifice of the Coronary Vein.



all the other cavities, but are not so numerous there. They are said to be particularly conspicuous in cases of diseased lungs.

The next cavity to be examined is the RIGHT VENTRICLE. To expose it satisfactorily, it should be divided extensively along the septum ventriculorum, superiorly and inferiorly. It is of a triangular form, and its sides are much thicker than the sides of the auricle, as they measure, most commonly, about three lines. Its internal surface is very irregular and rough, the muscular structure of it being thrown into projecting columns (the Columnæ Carneæ), of very indeterminate figures, arrangement, and dimensions. Some of them jut out, and are connected to the valve at the ostium venosum, by four or eight Chordæ Tendineæ; others pass from one side of the ventricle to the other, and a third series presents a reticulated appearance, lying on the face of the ventricle, and connected with it. Their general object is to strengthen the ventricle, to enable it to expel its contents, and to agitate well and mix the blood.

The Ostium Venosum has a tendinous margin, from which is reflected the lining membrane of the ventricle, so as to form a broad fold, which surrounds it. This fold being eight or ten lines wide, is irregularly divided at its floating edge, into three parts, whence the name of TRICUSPID VALVE has been given to it. The tricuspid valve is situated in the right ventricle, has its loose margin attached to the round tendinous cords just mentioned, called the Chordæ Tendineæ, which again arise, from the Columnæ Carneæ. These tendinous attachments of the tricuspid valve prevent it from being thrown into the auricle when the ventricle contracts.

At the upper part of the ventricle is the orifice of the pulmonary artery, which conveys the blood to the lungs; provision for it is made by the upper part of the ventricle becoming smooth. The orifice of the artery is round, and about twelve lines in diameter. From the internal surface of the artery, a little beyond its orifice, three valves arise, called Semilunar, which may be compared each to a semicircular plane, connected by its circumference to a cylindrical cavity. The diameter of the plane is loose; in the centre of it is a small cartilaginous body, the Corpusculum Aurantii; and on each side of the corpusculum, the diameter of the valve, instead of being a straight line, is slightly festooned. The valve is almost diaphanous, and seems to be produced by a reflection of the lining membrane of the artery. Between the coats of this reflection, however, there is to be found another substance, very much like that of the artery, which also forms a festooned edge a little below the one just described. As the three valves are placed in a row surrounding the artery, in its action they are thrown down, forming thereby a complete septum against the return of the blood into the ventricle; and the Corpuscula Aurantii, being in the middle of each, form a point of support or abutment, at which the edges of the valves sustain each other. Between the outer face of the valve and the internal face of the artery, a pocket attended with a dilatation of the artery is formed, called the Sinus of Valsalva.

The Pulmonary Artery is a large, white, fibrous tube, given off in the manner mentioned; under the arch of the aorta it divides into two branches, right and left, which go to the lungs of their respective sides. The right branch is the larger of the two, and, passing under the arch, is then minutely distributed to its lung. The left is in front of the descending aorta, and is distributed to the left lung with equal minuteness.

These trunks separate widely, and from the middle of their fork proceeds a ligamentous substance (the remains of the Ductus Arteriosus of the fœtus) to the aorta, posteriorly to the origin of the left subclavian artery.

The blood is brought from the lungs by the pulmonary veins, which are four in number, two on each side. The branches constituting the trunk of each of these veins, are generally united before the trunk penetrates the pericardium. This trunk afterwards unites with the auricle at one of its corners.

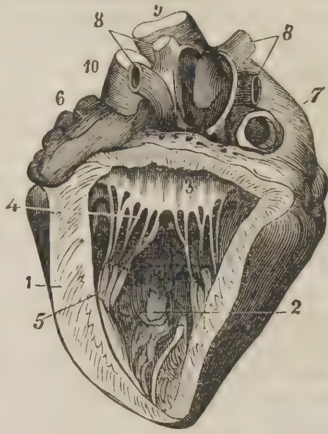
The Left Auricle has about the same cubic capacity with the right, but differs from it somewhat in its figure, in being more square. Its broad internal surface looks towards the spine. It is fixed to the posterior part of the left ventricle, and is divided, like the right auricle, into the Sinus Venosus, sometimes called Sinus Pulmonalis, and into the Proper Auricle. The latter is situated at the left side of the pulmonary artery, and is somewhat longer, narrower, more crooked, and more notched at its margins than the other proper auricle. When the left auricle is cut open, which should be done by a slit down its middle, it will be perceived that its parietes are thicker than those of the right, and that, both externally and internally, its surfaces are perfectly smooth, except in the proper auricular part, where the Musculi Pectinati prevail.

The Septum between the auricles, viewed on this side, is smooth, and does not present any remarkable appearance; when held up to the light, it is seen to be thinner and more transparent at the place corresponding with the fossa ovalis of the other side. At the anterior and inferior side of the auricle is the ostium venosum, communicating with the left ventricle; it has a tendinous margin, and is rather more than an inch in diameter.

The Left Ventricle differs from the right in shape, in being more conical, but it is equally capacious. Its anterior part constitutes the apex of the heart, and strikes against the ribs. The best mode of examining its cavity, is to make an incision through its parietes near the septum, and to separate it completely on that side from its fellow. Another incision should be made so as to detach it from the auricle, also near its septum. The latter cut is to be executed with particular care, so as to avoid wounding the interior structure. That done, we see its general arrangement within, corresponding with the right ventricle. Its parietes are eight lines through, being about three times as thick as the other. Its columnæ carneæ are larger and stronger, but arranged on the same principle, some passing from side to side of the cavity, others being reticulated and easily raised up from the part of the ventricle on which they lie, and a third set aiding the valvular apparatus at the ostium venosum.

Fig. 47.

A View of the Left Ventricle laid open.



1. Parietes of the Ventricle.
2. Its Cavity.
3. Mitral Valve.
4. Chordæ Tendineæ.
5. Columnæ Carneæ.
6. Right Auricle.
7. Left Auricle.

8, 8. The Four Pulmonary Veins.

9. Aorta.
10. Pulmonary Artery.

The Mitral Valve exists at the left ostium venosum, and is formed by a duplicature of the lining membrane of this ventricle. It is partially divided into two parts, which are pointed at their edges. Its columnæ carneæ are numerous and strong, and its chordæ tendineæ are of corresponding characters. The mitral valve prevents the regurgitation of blood into the left auricle, and is so placed that the upper half of it, when the blood is rushing into the ventricle, conceals the orifice of the aorta.

Towards the orifice of the aorta, which is at the posterior superior part of the ventricle, the surface of this cavity is smooth, to facilitate the passage of blood. The septum between the ventricles is of the same thickness with the left ventricle; it is formed partly by the right ventricle, but principally by the left.

The Mouth of the Aorta is about an inch in diameter, and is furnished with three Semilunar Valves, Corpuscula Aurantii, and Sinuses of Valsalva, after the same manner as the pulmonary artery, so that the description of one will suit the other, with the addition that those parts of the aorta are stronger and more developed. The coats of the aorta are nearly three times as thick as those of the pulmonary artery, to qualify it for bearing the increased pressure of the blood. The aorta is dilated shortly after its commencement, so as to form the large Sinus of Valsalva. The aorta lies first at the back of the pulmonary artery; it then gets to its right, being between it and the superior vena cava; part of it is there to the right of the spine; it then makes its arch, which brings it to the left of the spine, and in contact with it, about the third dorsal vertebra. The superior part of its arch is about eight lines below the upper edge of the sternum.

The heart being a mere machine for propelling blood, requires another source for its nourishment besides the fluid circulating through its great cavities; this is furnished by the Coronary Arteries, which are two in number. The first, called the Right Coronary, becomes visible between the pulmonary artery and the right auricle, and, passing on the septum between the right auricle and ventricle, extends around the heart to its flat side, distributing to the contiguous parts branches which for the most part pass off at right angles. The second or Left Coronary Artery appears between the pulmonary artery and the left auricle. Before it has become very obvious, it divides into two branches, one passes on the septum ventriculorum to the apex of the heart; the other winds on the septum between the left auricle and the left ventricle, and some of its branches pass on the flat surface of the heart to its apex.

The Coronary Veins receive the blood of the coronary arteries; a common trunk is formed by them, which passes for some distance on the septum, between the left auricle and ventricle, and then opens into the right auricle just anterior to the Eustachian Valve, at the spot already indicated.

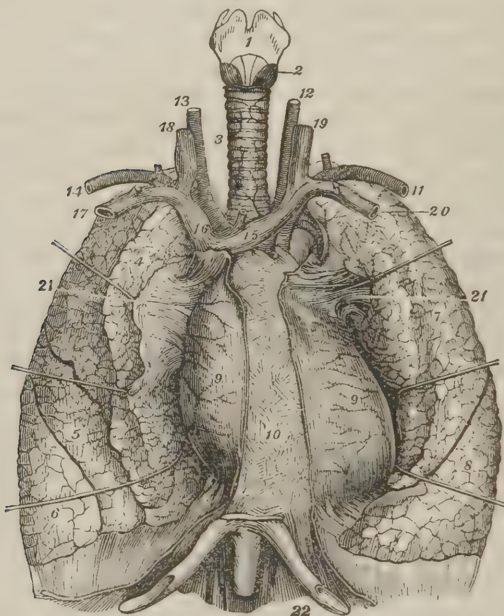
§ 4. OF THE LUNGS.

The LUNGS are of a bluish color, and occupy by far the greater part of the cavity of the thorax; they are two distinct bodies, placed one at either side of the heart, from which circumstance they are divided into right and left lung. Their external shape and dimensions, with an inconsiderable exception, are the same, as they correspond in their periphery with the symmetrical sides of the thorax. The apex of the heart, from being pushed into the lung of the left side, gives its surface towards the mediastinum a somewhat different figure from the lung of the right side; the left lung is also the smaller.

To appreciate the extent and form of the lung, it must be recollected that the cavity of the thorax is much deeper behind than it is before. The vertical diameter, before, amounts only to the length of the two upper bones of the sternum, whereas the same diameter, behind, is the whole length of the column formed by the dorsal vertebræ. The figure of each lung is also modified by the convexity of the diaphragm; for this body, extending from the lower point of the dorsal vertebræ obliquely upwards to the end of the second bone of the sternum, would, if it were only a plain surface, influence the contiguous faces of the lungs, so as to make them resemble, when united, the inferior part of an ox's hoof; but this resemblance is much increased by the diaphragm forming a convexity towards the thorax, which rises much above what its plane would do. The similitude of the lungs to the ox's hoof, with the back part foremost, is therefore sufficiently exact for anatomical comparison, and particularly as it regards their inferior surface.

The lung lies loose everywhere, except at the surface corresponding to the side of the basis of the heart; here it is attached to the heart by the pulmonary veins, pulmonary artery, and by a branch of the trachea. These tubes constitute the Root of the lung, and over the root the pleura is reflected from the pericardium. The pleura which covers the root of the lung is extended downwards, under the name of the Ligamentum Pulmonis, and serves to fasten the posterior edge of the lung to the pericardium, as low down as the diaphragm.

Fig. 48.



A Front View of the Larynx, Trachea, and Lungs, with the Heart inclosed in the Pericardium.

1. Thyroid Cartilage.
2. Crico-thyroid Muscle.
3. Trachea.

4, 5, 6. Upper, Middle, and Lower Lobes of the Right Lung.

7, 8. Upper and Lower Lobes of the Left Lung.

9, 9. Pericardium investing the Heart.

10. Mediastinum.
11. Left Subclavian Artery.
12. Left Primitive Carotid.
13. Right Primitive Carotid.
14. Left Subclavian Artery.
15. Left Vena Innominata.
16. Right Vena Innominata.
17. Right Subclavian Vein.
18. Right Internal Jugular.
19. Left Internal Jugular.
20. Left Subclavian Vein.
21. Root of the Lungs.
22. Ligamentum Pulmonis.

The Right Lung is divided by an oblique and a horizontal fissure passing from it, into three lobes—the Left

Lung has a single oblique fissure dividing it into two lobes. Each lobe consists of a multitude of lobules adhering laterally by cellular substance; and each lobule is formed of a congeries of air-vesicles, which communicate freely through their sides from the imperfection of the latter, though the cells of different lobules do not communicate.

The parietes of the air-vesicles are of extreme tenuity, and have the pulmonary artery and vein ramifying with exceeding minuteness on them for the purposes of respiration.

The lung of the bullock exhibits this structure better than that of the human lung, by a little tearing of the parts asunder. The lobuli are also well seen in the fœtus, and in very young subjects.

The TRACHEA, the bifurcation of which forms the Bronchiæ, is an almost cylindrical tube, which passes in front of the œsophagus and of the vertebræ, from the inferior part of the larynx, to the third dorsal vertebræ; it there divides into the Bronchiæ, and is placed between the pleuræ of the two sides of the thorax. The right Bronchia is shorter, larger, and less slanting than the left; it sinks below the pulmonary artery, and penetrates the lung op-

Fig. 49.

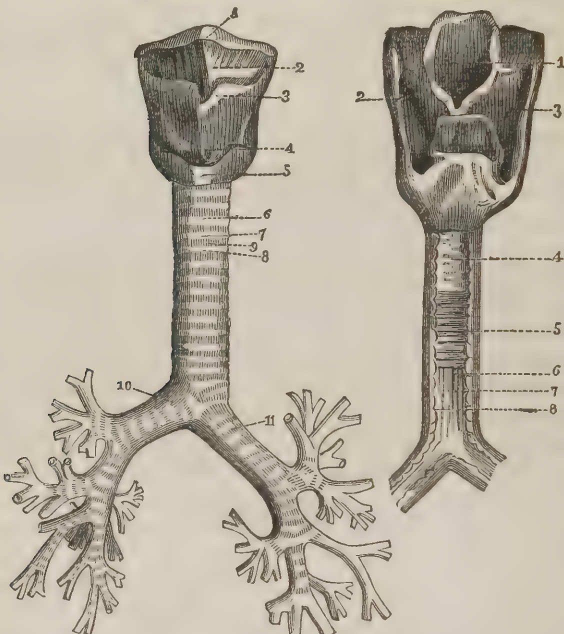
TERMINAL VESICLES OF THE LUNG, HANGING TO A BRANCH OF THE BRONCHIA AS BERRIES HANG TO THEIR STALK.

posite to the fourth dorsal vertebra; the left being long and narrow, enters the lung below the pulmonary artery, opposite to the fifth dorsal vertebra. The bronchiæ then divide and subdivide through the structure of the lung, till the ultimate extremities terminate in the air-vesicles.

The Trachea preserves its cylindrical shape, and is kept open by a cartilaginous structure, which is composed of from sixteen to twenty pieces, more or less distinct from each other. Thus arranged, the cartilages form about two-

Fig. 50.

A. B.



A. A Front View of the Larynx, Trachea, and Bronchial Tubes.

1. Hyoid Bone.
2. Thyro-hyoid Membrane.
3. Thyroid Cartilage.
4. Crico-thyroid Membrane.
5. Cricoid Cartilage.
6. Trachea.

7, 8. Two Cartilaginous Rings.

9. Membrane which separates them.
10. Right Bronchus and its divisions.
11. Left Bronchus.

B. The Larynx, Trachea, and commencement of the Bronchial Tubes, viewed from behind.

1. Upper opening of the Larynx.

2, 3. Lateral grooves of the Larynx.

4. Fibrous membrane of the Trachea, interspersed with small Glands, beneath which is seen
5. The Muscular Fibres; beneath this last are seen

6, 7. Small Fibrous Bands.

8. The Mucous Membrane seen between them.

thirds of the circumference of a circle, occupying the front of the trachea, and giving it the appearance, anteriorly, of a cartilaginous tube. The remaining third is membranous. The cartilages of the trachea are deposited in a kind of perichondrium, possessed of extreme elasticity, which has continually a tendency to approximate the cartilages, and is resisted only by the attachments of the two extremities of the trachea. The effect of this elasticity is demonstrated in the living body by attempts at suicide, where the trachea being cut through, so great a gap is made in the throat that it presents the appearance of a part having been removed. The deficiency at the back part of the cartilages is filled up by a condensed cellular substance in continuation with this elastic membrane. Transverse muscular fibres are placed between the extremities of the cartilages, and, by their contractions, bring them towards each other; according to the opinion of the late Dr. PHYSICK, by diminishing the size of the trachea, they assist in the expulsion of mucus. A continuation of the mucous membrane of the Pharynx and Larynx, lines the trachea; it is studded with a great number of follicles which secrete mucus. Under the membrane are many glands, from the size of a millet-seed to that of the head of a small pin, and which have their excretory tubes terminating in the trachea. These glands are also abundant on the posterior face of the transverse muscular fibres.

The BRONCHIÆ, in dividing, still preserve for some length the cartilaginous structure of the trachea, but as they approach their terminations, the deficiency at their back part ceases, and the cartilages form sections of circles, which produce, by the apposition of several of them, complete cylinders. This arrangement holds, till finally the cartilaginous structure ceases, and only membrane is left. It is probable, from the elasticity of the lung, and from its collapsing when the thorax is opened, that the elastic membrane, in which the cartilages are deposited, forms the essential cellular structure of this organ on which the bloodvessels are ramified.

At the lower end of the trachea, and about the root of the lungs, is found the commencement of a chain of lymphatic glands, which follow for some distance the bronchiæ. In the adult they are black and numerous, varying from the dimension of a large pin's head to that of a kidney bean.

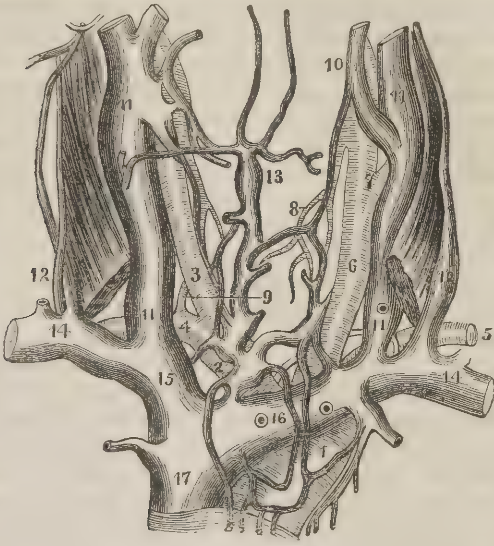
The lungs are furnished from the aorta with nutritious vessels, called Bronchial Arteries. They follow the course of the bronchiæ and communicate freely with the pulmonary arteries; notwithstanding, they have their proper veins, which empty on the right side, into the vena azygos, and on the left into the subclavian vein. The bronchial veins also communicate freely with the pulmonary veins.

While studying the contents of the thorax, it is of the first importance to attend to the relative situation of the parts included in the description. One of the most useful and interesting points, is the space between the two upper ribs, bounded laterally by the pleuræ, anteriorly by the sternum, posteriorly by the upper dorsal vertebræ, and having the top of the pericardium for its basis. This cavity is too irregular to admit of comparison with anything else, without a hazard of communicating false ideas of its shape. The course of the pleura on each side must be well attended to, and, in order to understand it, the obliquity of the first rib must be taken into consideration. Considering the spine as a vertical column, the first rib, so far from being horizontal, is in a majority of subjects inclined downwards so much that it makes an angle of about forty-five degrees with the spine; and the pleura being reflected from the internal edge of the first rib, from its head to its front part, will, of course, observe a similar obliquity. It is probably this circumstance which Sabatier, Sœmmering, and Colles allude to, when they speak of the pleura rising above the level of the first rib. This arrangement should influence the considerations arising from a wound in the lower part of the neck; as a ball or sword, passing through horizontally just above the sternal end of the clavicle, would certainly enter the cavity of the pleura in a great number of persons.

In the upper section of the mediastinum, just at the upper edge of the sternum, are the remains of the Thymus Gland, much shrivelled, having a ligamentous feel, and of a light pink color. In contact with the pleura on the

Fig. 51.

RELATIVE POSITION OF THE ARTERIES AND VEINS OF THE NECK.



1. Aorta.
2. Arteria Innominata.
3. Right Primitive Carotid.
4. Right Subclavian Artery.
5. Left Subclavian Artery.
6. Left Primitive Carotid.
7. Its Bifurcation into the Internal and External Carotids.
8. Superior Thyroid Artery.
9. Vertebral Artery.
10. Facial Vein.
11. Internal Jugular Vein.
12. External Jugular Vein.
13. Thyroidal Vein.
14, 14. Subclavian Vein.
15. Vena Innominata or Brachio-Cephalic Vein of Right Side.
16. Same of Left Side, called also the Transverse Vein.
17. Vena Cava Descendens.

right is the Descending Vena Cava. The common trunk of the left subclavian and internal jugular veins (Vena Innominata), after crossing by an oblique descent the upper portion of the sternum, joins the descending vena cava about an inch above the place where the latter penetrates into the pericardium. Behind this transverse vein are the top of the arch of the Aorta, the origin of the Arteria Innominata, the Left Carotid, and the Left Subclavian Artery. The œsophagus makes a vertical descent just before the dorsal vertebræ; the trachea is placed before it, and we see the arteria innominata crossing the latter obliquely from left to right. The arteria innominata is placed much more superficially than the left subclavian, being removed from the upper end of the sternum only by the thickness of the transverse vein, and is very accessible; whereas the other, being the last branch given off from the curve of the aorta in its course backwards, is an inch deeper, and extremely difficult of access in the living body. The arteria innominata varies much in length, before its division into subclavian and carotid. I have examples of it from half an inch to two inches, but the general length is about sixteen lines.

In this dissection, the phrenic nerve is seen to descend in contact with the internal edge of the scalenus anticus muscle, and passing between the subclavian artery and vein, to proceed vertically in contact with the pleura at first, and afterwards between it and the pericardium, to the diaphragm. The par vagum is on the inner side of the internal jugular vein, and gets into the thorax, between the subclavian artery and vein, near the origin of the subclavian artery. The trunk of it passes along the side of the trachea, and behind the root of the lungs to the œsophagus, and terminates at the stomach. On a level with the subclavian artery, the Recurrent or Inferior Laryngeal Nerve is sent off, which, in order to get to the larynx, winds around the subclavian of the right, and the aorta on the left side. About the root of the lungs, the Pulmonary Plexus is detached from the Par Vagum Nerve. The Sympathetic Nerve lies closer to the vertebræ, and sends off from its two inferior cervical ganglions principally the branches which supply the heart, by the cardiac plexus. In the thorax it continues its course by the heads of the ribs, and, sending off the greater and lesser Splanchnic nerves, is distributed in a manner to be described hereafter.

In making this dissection, it must be observed that, from the lower part of the thyroid gland, the condensed membrane called Fascia Profunda Cervicis, which seems to afford protection to the upper opening of the thorax, and is extended to the upper edge of the sternum, has beneath it, connecting the vessels and other parts together, a loose, vascular, adipose, and cellular matter, which must be removed by dissection, before the rest of the structure can be rendered distinct. The plan for opening the thorax, by the sternum being sawed in two longitudinally, and kept open to the distance of an inch or so, is by far the most exact and satisfactory manner of studying these parts.

This stage of the dissection having been accomplished, the sternum must be removed, and, by turning up the lungs, we see the parts contained in the posterior mediastinum, and what is meant by it. To the left is the Aorta, which gradually gets to the front of the dorsal vertebræ in the lower part of the thorax, as it penetrates the crura of the diaphragm. The Œsophagus is in the middle above, but in getting to its own opening in the diaphragm, it crosses the aorta very obliquely, and is then to the left of the lower dorsal vertebræ. The Vena Azygos, made up of the six lower intercostal veins on the left side, and the ten lower of the right, occupies the right side of the mediastinum, and forms an arch at its termination where it joins the descending cava, over the root of the right lung. The Thoracic Duct enters the thorax between the crura of the diaphragm, and passes nearly in the middle line between the aorta and the vena azygos, till it reaches the third dorsal vertebra; it then inclines to the left side, and rising into the root of the neck, forms an arch which terminates in the angle produced by the conjunction of the left internal jugular and subclavian vein. The Par Vagum is strictly within the limits of the posterior mediastinum, the Sympathetic is not.

SECTION III.

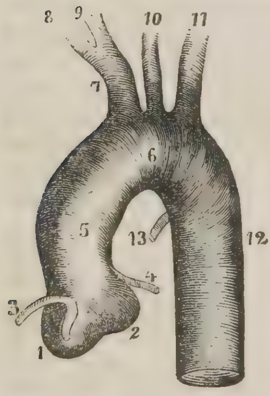
BLOODVESSELS OF THE THORAX.

After noting the position of the arch of the aorta, the student may next give his attention to its various thoracic branches.

The course of the aorta, from its origin to its passage through the diaphragm, is mentioned in connection with the heart, as well as the fact that a line to subtend the base of its curvature must be drawn from the sternal extremity of the third rib on the right to the dorsal extremity of the third rib on the left side. The first branches given off after the coronary arteries, are the Arteria Innominata, the Left Carotid, and the Left Subclavian. The ARTERIA INNOMINATA is in advance of the others, and divides after an inch or an inch and a half of the length, into Right Carotid and Right Subclavian. For an exposition of the course of the Carotids, see the article NECK.

Fig. 52.

ARCH OF THE AORTA AND THE VESSELS GIVEN OFF FROM IT.



1, 2. Dilated Origin of the Artery, showing the position of the Sinuses of Valsalva.
3. Right Coronary Artery.
4. Left Coronary.
5. Ascending Aorta.
6. Its Arch.
7. Arteria Innominata.
8. Right Subclavian Artery.
9. Right Primitive Carotid.
10. Left Primitive Carotid.
11. Left Subclavian Artery.
12. Descending or Thoracic Aorta.
13. Remains of the Ductus Arteriosus of the Fœtus.

The SUBCLAVIAN ARTERY, before it passes between the scaleni muscles, sends off five branches: of which the Inferior Thyroid, the Vertebral, and the Transverse Artery of the neck are mentioned in the article Neck. The remaining two, to wit, the Internal Mammary and the Superior Intercostal belong to the trunk.

The INTERNAL MAMMARY ARTERY, after its origin, descends immediately along the internal margin of the scalenus anticus, and places itself between the pleura and the cartilages of the true ribs, about three-fourths of an inch from the outer edge of the sternum; it gets into the abdomen, and is distributed finally to the rectus muscle, anastomosing in it with the epigastric artery. It sends a branch (Phrenica Superior) which attends the phrenic nerve on the side of the pericardium; it then supplies the intercostal muscles, anastomoses with the intercostal arteries, and sends some branches to the mamma.

The SUPERIOR INTERCOSTAL ARTERY, arising from the under surface of the subclavian, opposite the inferior thyroid, runs across the neck of the first rib, and supplies the two upper intercostal spaces; it also, sometimes, supplies the third intercostal space.

Below its curvature, in the thorax, the aorta gives off the Œsophageal, the Bronchial, the Posterior Mediastinal, and the Intercostal Arteries.

The BRONCHIAL ARTERIES are vessels intended for the nourishment of the lungs; the right comes from the superior aortic intercostal artery, and the left from the aorta; this arrangement is not uniform, for sometimes both come from the aorta.

The ŒSOPHAGEAL ARTERIES are five or six in number, and are spent upon the œsophagus, as their name implies; the lowermost descends to the stomach.

The POSTERIOR MEDIASTINAL, as their name indicates, supply the posterior mediastinum, and its contents.

The AORTIC INTERCOSTALS, supply commonly, the ten inferior intercostal spaces. The upper ones have to rise somewhat obliquely to get to their destination, whereas, the lower ones pass nearly horizontally. The right are longer than the left, and the œsophagus is in front of them. Each one joins the rib near its tubercle, and keeps at its lower edge, between the internal and external intercostal muscles in the groove of the bone. The first branch is the dorsal, given off near the spine; which passes to the muscles of the back, and dispatches an arteriole through the intervertebral foramen to the medulla spinalis. When the intercostal arrives near the middle of the rib, it sends off a branch which passes near the upper edge of the lower rib. When it has got two-thirds of the length of the rib, it leaves the lower edge to be distributed to the intercostal space and contiguous parts.

The distribution of the thoracic nerves may be most advantageously studied, after the dissection of the neck has enabled the student to trace them from their origins downwards.

CHAPTER VI.

OF THE HEAD.

[THE study of the structure of the Head should be commenced by examining, first, the general character of its external coverings. The integuments, as found on the top of the cranium, consist of the skin with its hair—a dense cellular tissue, containing but little adeps, and a tendinous expansion which unites a muscle on the front to another on the back part of this bony box (Occipito-Frontalis).]

The integuments of the cranium are remarkably thick and hard, but give the sensation, when felt externally, of being a very thin layer spread over the bones. The latter is particularly the case as far as the hair extends. The movable character of the scalp is due to the loose attachment of the tendon of the occipito-frontalis muscle to the pericranium, or membrane which covers the bones.

Inside of the bones we find the brain, which may be studied either prior or subsequent to the dissection of the other parts, according as the subject is injected with chloride of zinc, or some other antiseptic, which, by hardening its structure, facilitates its investigation. But if the subject has not been injected, the brain should be removed as soon as possible, as it decomposes rapidly, and becomes so soft as to be unfit for study. In dissecting the face, it will prove advantageous to study the muscles on one side, and the nerves and bloodvessels on the other.]

SECTION I.

OF THE MUSCLES OF THE HEAD AND FACE.

[The muscles of the face are so readily affected by *post-mortem* changes that the student who wishes to see them in perfection should study them either at an early period of the dissection or obtain a fresh subject. They may be studied in the following order]:—

The OCCIPITO-FRONTALIS, a single muscle, consists of two symmetrical parts, and, coming from the back of the head, is inserted into the front of it. It is superficial, being placed immediately below the skin of the scalp; and has four bellies of muscular fibres, two behind and two before, connected by a thin tendon which covers all the top of the head. The dissection of this muscle is difficult, from the close adhesion of its tendon to the pericranium below, and to the common integuments above. It is best, therefore, to commence by making one incision through the integuments only, from the root of the nose to the fore end of the sagittal suture; and another from the commencement of the first along the upper margin of each eyebrow, to the external angular process of the os frontis; by raising up this flap, and enlarging it in an appropriate manner on each side, it will lead to the dissection of the whole muscle.

The Occipito-frontalis arises from the superior semicircular ridge of the os occipitis by tendinous and fleshy fibres, which form two distinct bellies (Musculus Occipitalis) about an inch and a half long, one on each side of the bone. Its tendon, when carefully traced, will be found terminating a little in front of the coronal suture, in the two anterior fleshy bellies (Musculus Frontalis) which cover the whole front part of the os frontis. The internal edges of these latter are in conjunction below.

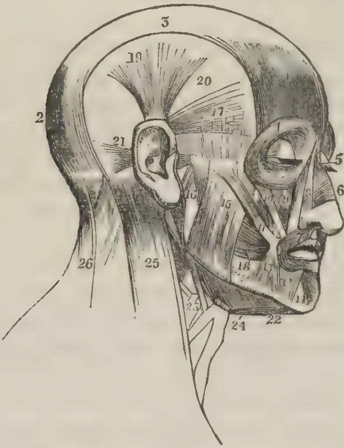
It is inserted fleshy on each side into the superior margin of the orbicularis oculi and of the corrugator supercilii; and by its nasal slip into the internal angular process of the os frontis, and into the root of the os nasi.

It pulls the skin of the head backwards and forwards, and throws that of the forehead into horizontal wrinkles. It also elevates the supercilia.

Its fleshy portion is said to have covered, in some instances, the whole skull-cap.

The COMPRESSOR NARIS arises by a pointed beginning from the root of the ala nasi; it spreads like a fan over the lateral parts of the nose below, is inserted into its fellow of the opposite side on the dorsum of the nose, and into the lower part of the os nasi, where it is connected with the nasal slip of the occipito-frontalis.

Fig. 53.



MUSCLES OF THE FACE.

1. Frontal portion of the Occipito-Frontalis.
2. Its Posterior or Occipital portion.
3. Its Aponeurosis.
4. Orbicularis Palpebræ, which conceals the Corrugator Supercilii, and Tensor Tarsi of Horner.
5. Pyramidalis Nasi.
6. Compressor Naris.
7. Orbicularis Oris.
8. Levator Labii Superioris Alæque Nasi.
9. Levator Labii Superioris.
10. Zygomaticus Minor
11. Zygomaticus Major.
12. Depressor Labii Inferioris.
13. Depressor Anguli Oris.
14. Levator Labii Inferioris.
15. Superficial Portion of the Masseter.
16. Its Deep Portion.
18. Buccinator.
19. Attollens Auriculæ Muscle.
20. Temporal Aponeurosis which conceals the Temporal Muscle.
21 Retrahens Auriculæ Muscle.
22. Anterior Belly of the Digastric—the Tendon is seen passing through the Loop formed by the Cervical Fascia.
23. Stylo-hyoid Muscle.
24. Mylo-hyoid Muscle.
25. Sterno-mastoid Muscle.
26. Upper part of the Trapezius—the Muscle between 25 and 26 is the Splenius.

This muscle consists of thin and pale fibres placed immediately under the skin. If it act from both extremities by its curved fibres being made straight, it will compress the nostril; but if it act from its dorsal margin assisted by the nasal slip of the occipito-frontalis, it will dilate the ala nasi, and has, therefore, been called Dilatans Nasum, by Columbus.

The ORBICULARIS PALPEBRARUM is a broad circular muscle, lying immediately under the skin of the eyelids, and over the tarsi cartilages. It covers the whole front of the bony orbit, and extends from four to eight lines beyond its margin. The fixed part of the muscle is principally the ligamentum palpebrale internum and the internal canthus of the orbit, being elsewhere connected to subjacent parts by cellular tissue; its temporal section is fastened to the temporal fascia beneath.

It arises fleshy from the internal angular process of the frontal bone, from the upper end of the nasal process of the os maxillare superius and the os unguis, and from the superior edge of the round horizontal tendon, called internal palpebral ligament, that fixes the internal commissure of the eyelids to the nasal process of the superior maxilla. These fibres perform the circuit of the eyelids, and, coming around to the internal canthus again, are inserted into the orbital margin of the nasal process, and into the orbitar process of the upper maxilla, and into the lower edge of the same horizontal tendon from which it arose.

The Ciliaris muscle of Albinus is the internal margin of the orbicularis, planted on the edges of the tarsi cartilages.

As the Orbicularis muscle is fixed at its nasal and temporal portions more than elsewhere, it is obvious that the contraction of its circular or curved fibres by making them straight, will close the eyelids and wrinkle the skin on them. This muscle frequently has a slip from its lower border to the upper lip, anterior to the zygomaticus minor.

The CORRUGATOR SUPERCILII is placed beneath the upper margin of the orbicularis, at the internal end of the superciliary ridge. It arises from the internal angular process of the os frontis, and passing obliquely upwards and outwards, between the lower edge of the occipito-frontalis and the upper edge of the orbicularis, is concealed by them. It is inserted into the former principally, but its fibres also blend with the latter.

It draws the eyebrow and skin of the forehead into vertical wrinkles, and also draws them over the eye so as to overshadow it.

The LEVATOR LABII SUPERIORIS ALÆQUE NASI is fixed just at the side of the nose. It arises by a pointed production, from the nasal process of the os maxillare superius at the internal canthus of the eye, and by a broad origin from the anterior margin of the orbitar process of the same bone. Passing downwards, it is inserted into the side of the ala nasi, and into the upper lip, being narrower below than above. The part of this muscle which comes from the orbitar process is so distinct, that Albinus and others give it the exclusive name of Levator Labii Superioris.

It draws the upper lip and the ala nasi upwards.

Just beneath this muscle there is sometimes a fasciculus, called the Anomalus Faciei of Albinus, which is attached by one end to the upper jaw near the canine fossa, and by the other to the upper lip.

The LEVATOR ANGULI ORIS, is a small muscle concealed very much by the last; it arises from the anterior part of the superior maxillary bone, between the foramen infra-orbitarium and the first small grinder, and is inserted into the corner of the mouth.

It raises the angle of the mouth.

The ZIGOMATICUS MINOR is a small muscle sometimes deficient and sometimes double, arising from the forepart of the os malæ; it descends obliquely, and is inserted into the upper lip just above the corner of the mouth.

The ZIGOMATICUS MAJOR, being on the outside of the last, and much larger, arises from the malar bone externally at its posterior inferior part, just above the lower edge, where this bone contributes to form the zygoma, and passing obliquely downwards is inserted into the corner of the mouth, and runs into the depressor anguli oris.

These last two muscles draw the corner of the mouth towards the cheek bone, or obliquely upwards and outwards, as in smiling.

The DEPRESSOR LABII SUPERIORIS ALÆQUE NASI, is concealed by the orbicularis oris, and by the levator labii superioris alæque nasi. To get a view of it, the upper lip must be inverted, and the lining membrane of the mouth removed on the side of the frænum of the lip. This muscle arises from the inferior part of the upper maxilla, in front of the alveolar processes for the dens caninus and the incisores, and is inserted into the side of the ala nasi, and into the contiguous part of the upper lip.

It depresses the upper lip and the ala nasi.

The DEPRESSOR ANGULI ORIS, arises broad and fleshy from the base of the lower jaw on the side of the chin; being somewhat triangular, its apex is inserted into the corner of the mouth.

This muscle draws the corner of the mouth downwards. It lies immediately under the skin, and blends above with the zygomaticus major and with the levator anguli oris.

The DEPRESSOR LABII INFERIORIS is, in part, beneath the last muscle, and, like it, arises broad and fleshy from the basis of the lower jaw on the side of the chin; its fibres pass obliquely upwards and inwards, and are inserted into the whole side of the lower lip.

It draws the lip downwards.

These last two muscles are much obscured by being mixed with a quantity of adipose matter; the skin also is closely blended with them, and the roots of the beard penetrate between the intervals of their fibres.

Its exterior border is often formed by the Platysma-Myodes.

The Levator Menti vel Labii Inferioris, being placed beneath the depressor labii inferioris, is demonstrated by turning down the lower lip and dissecting away its lining membrane on the side of the frænum. It will then be seen to arise in front of the alveolar processes of the external incisor and the canine tooth of the lower jaw, and passing obliquely downwards to be inserted into the lower lip.

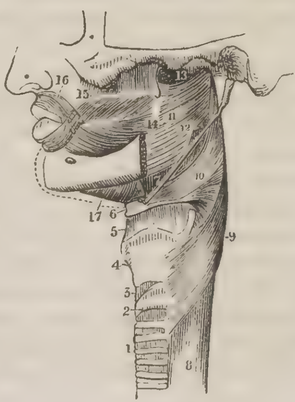
It elevates the lower lip.

The Buccinator arises from the root of the coronoid process of the lower maxilla, from the back part of the upper maxilla near the pterygoid process of the sphenoid bone, and from the roots of the alveolar processes of both the upper and lower maxillary bones, as far forwards as the dentes bicuspides. It is inserted into the corner of the mouth, and into the contiguous parts of the upper and lower lip.

It draws the corners of the mouth directly backwards.

Fig. 54.

A Side View of the Muscles of the Pharynx.



1. The Trachea.
2. The Cricoid Cartilage.
3. The Crico-thyroid Ligament.
4. The Thyroid Cartilage.
5. The Thyro-hyoid Ligament.
6. The Hyoid Bone.
7. The Stylo-hyoid Ligament.
8. The Œsophagus.
9. The Inferior Constrictor Muscle.
10. The Middle Constrictor "
11. The Superior Constrictor "
12. The Stylo-pharyngeus Muscle passing down between the Superior and Middle Constrictors.
13. The Upper Concave Border of the Superior Constrictor. At this point the muscular fibres of the Pharynx are deficient.
14. The Pterygo-Maxillary Ligament.
15. The Buccinator Muscle.
16. The Orbicularis Oris Muscle.
17. The Mylo-hyoid Muscle.

The ORBICULARIS ORIS is a circular muscle just beneath the skin, much blended with adipose matter externally, but more plain on the surface contiguous to the lining membrane of the mouth. It constitutes a considerable part of the thickness of the lips, and surrounds the mouth entirely. It has no bony origin, but arises from the fibres of the several muscles which join each other at the corner of the mouth, and, therefore, consists of two semicircular planes, one for the upper and the other for the lower lip.

It is the antagonist of most of the other muscles of the mouth. From its superior part, a pyramidal slip goes to the tip of the nose, called by Albinus, Nasalis Labii Superioris.

Before proceeding farther, the student should notice an important gland, the Parotid, whose duct passes through the Buccinator muscle (see p. 272).

The MASSETER is placed immediately between the skin and ramus of the lower jaw. It arises tendinous and fleshy from the malar process of the upper maxilla, and from the inferior edge of the malar bone between the maxillary and zygomatic sutures; and from the zygomatic process of the temporal bone. The masseter covers all the exterior surface of the ramus of the lower jaw, as low down as its base. It is divided into two portions, which lie one beneath the other; the internal is the smaller, and is inserted tendinous into the outer part of the root of the coronoid process. The external, extends from the malar bone to the angle of the inferior maxilla, where it is inserted tendinous and fleshy. A part of the internal portion may be seen at the zygomatic suture behind the external, without the latter being raised up.

When both portions act together, they close the jaws; the external alone also draws the lower jaw forwards; and the internal alone will draw it backwards.

For an account of the Ear, see page 254.

The TEMPORALIS muscle lies on the side of the head, occupying its middle inferior region; it is covered externally by a thick dense tendinous membrane, the fascia temporalis, which arises from the semicircular ridge on the side of the cranium, and is inserted into the upper margin of the zygoma. By removing this fascia, the temporal muscle is seen to arise fleshy from its inner surface from the whole length of the semicircular ridge on the side of the os frontis and parietale, also from the surface of the cranium between this ridge and the zygoma, including the part contributed by the frontal bone, the lower part of the parietal, the squamous portion of the temporal and the sphenoid. It also receives a small accession of fleshy fibres from the internal face of the zygoma. From this extensive origin the fibres converge towards the zygoma, and are inserted tendinous into the coronoid process of the lower jaw, surrounding it on every side; some of these tendinous fibres, in front, go down nearly as low as the last dens molaris.

It pulls the lower jaw directly upwards.

This is a proper place, also, for looking at the Pterygoid muscles; they are, however, but imperfectly seen. The only way to get a very good view of them is to make the dissection on a vertical section of the head, or on a head detached from the cervical vertebræ, which can be done very conveniently when we are engaged in the study of the nose, or of the pharynx.

The Pterygoideus Externus, so called from its position, arises fleshy from the outer side of the external pterygoid process of the sphenoid bone, from the under surface of the temporal and spinous process of the same bone, and from the tuber of the upper maxilla. It passes outwards and backwards horizontally, and is inserted into the inner side of the neck of the inferior maxilla and into the capsular ligament of the articulation.

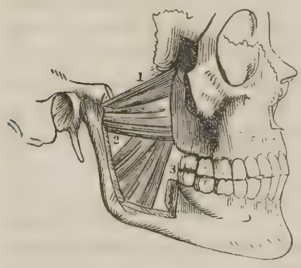
When the muscles of the opposite sides act together, they draw the lower jaw forwards, but, if alternately, they give it a grinding motion.

The Pterygoideus Internus arises by tendinous and fleshy fibres from the internal pterygoid process of the sphenoid bone, along the outer side of the Eustachian tube, and from the greater part of the pterygoid fossa. Passing downwards and backwards, it is inserted tendinous and fleshy into the interior face of the angle of the lower jaw.

When the muscles of the opposite sides act they close the jaw.

Fig. 55.

THE TWO PTERYGOID MUSCLES. THE ZYGOMATIC ARCH AND THE GREATER PART OF THE RAMUS OF THE LOWER JAW HAVE BEEN REMOVED, IN ORDER TO BRING THESE MUSCLES INTO VIEW.



1. The Sphenoid Origin of the External Pterygoid Muscle.
2. Its Pterygoid Origin.
3. The Internal Pterygoid Muscle.

For a description of the arteries of the face, see Neck.

SECTION II.

OF THE ENCEPHALON OR BRAIN.

The best way to get at the brain, both in public and private dissection, is to make a cut through the scalp across the top of the head from ear to ear, then to turn down the scalp and tendon of the occipito-frontalis muscle over the face, and behind the back of the neck. The skull-cap may be separated by a saw carried only through the external table just above the tips of the ears, and about an inch above the superciliary ridges. With the aid of an iron chisel, and a mallet, the bone is afterwards easily broken through and separated from the dura mater. Should the adhesion of the latter be great, a common spatula is very well adapted to destroy it. Bichat broke the skull-cap to pieces with a hammer and then removed it, which is a much inferior mode to the other, and objectionable from the spiculæ of bone made by it.

The vault of the cranium being removed as directed, an inspection of its internal table shows us the grooved channels made by the Arteria Meningea Media over nearly its whole surface—the groove for the Superior Longitudinal Sinus, on its middle line, and a number of ulcerated-looking fossæ made by the Glands of Pacchioni.

The medullary mass placed within the cavity of the cranium is termed in common language Brain. It affords the following parts for separate examination: 1. The Membranes. 2. The Cerebrum. 3. The Cerebellum. 4. The Pons Varolii and the Medulla Oblongata.

1. The MEMBRANES of the Brain are three: The Dura Mater, Tunica Arachnoidea, and Pia Mater.

The DURA MATER lies immediately in contact with the bones of the cavity of the cranium, being closely connected to them at every point by filaments of fibres, and by very numerous small bloodvessels, which are shown by the dots of blood upon it, when the bones are removed as in this manner of opening the head. It is a white, shining, fibrous, semitransparent membrane consisting of two layers closely adherent to each other, the internal of which forms several processes. The most conspicuous is the Falx Major, or Cerebri, which arises from the middle of the body of the sphenoid bone, from the crista galli of the ethmoid, from under the whole of the middle line of the frontal bone, the sagittal suture, and superior part of the occipital bone, as far as the junction of the limbs of its cross at the internal occipital protuberance. It is narrow before and broader behind, where it joins with the tentorium.

Being strongly fastened in front and behind, it is kept in a state of strict tension, which prevents any lateral deviation. Its inferior edge is concave, and reaches nearly to the Corpus Callosum.

The next process is the TENTORIUM, which forms an arch slightly convex above, and crescentic in its general figure. It is connected to the Falx Major, to the hori-

Fig. 56.

OBLIQUE VIEW OF THE INTERIOR OF THE CRANIUM AS LINED BY THE DURA MATER.

1. Falciform Process.
2. Its Superior or Attached Border containing the Longitudinal Sinus.
3. Its Free Border.
4. Continuation of the Falciform Process with (6) the Tentorium.

7, 8. Free Concave Edge of the Tentorium.

9. Termination of this edge at the Anterior Clinoid Process.
10. Attached Border of the Tentorium continued along the Upper Angle of the Petrous Bone to the Posterior Clinoid Process.

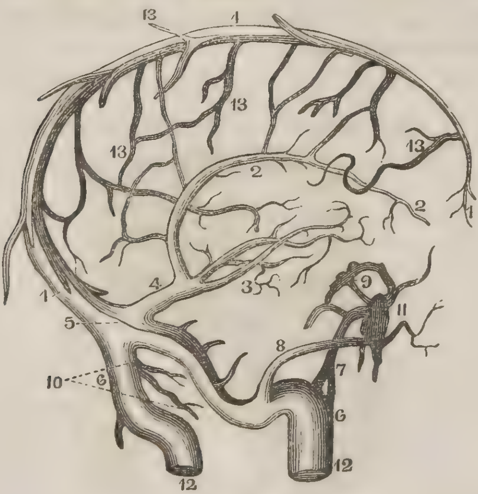
zontal limbs of the occipital cross, to the superior ridge of the petrous bones, and to the posterior clinoid apophysis on each side. On each side of the sella turcica, is a process of dura mater forming its lateral boundaries. At the anterior edge of the tentorium is the Foramen Ovale, which is occupied by the Pons Varolii and Crura Cerebri, and immediately under the centre of the tentorium and running towards the occipital foramen, is the Falx Minor or Cerebelli.

§ 1. SINUSES OF THE DURA MATER.

The *Sinuses* of the Brain are large cavities placed between the two laminæ of the Dura Mater, and receive the blood from the veins of the Pia Mater. They are formed by the separation of these laminæ, and are lined by a membrane, corresponding with the internal coat of the veins.

The first is the Superior Longitudinal Sinus, and is triangular; it commences by a small beginning near the crista galli, having, according to some, a small vein from the nose joining it through the foramen cæcum. It enlarges by a continual accession of veins from the pia mater and terminates at the occipital cross. On cutting into it, we see it lined by a delicate smooth membrane—

Fig. 57.



SINUSES OF THE DURA MATER.

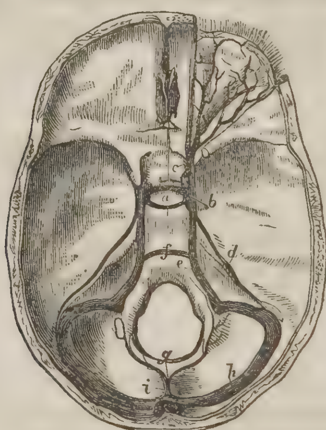
1. Superior Longitudinal Sinus.
2. Inferior Longitudinal Sinus.
3. The two Venæ Galeni.
4. Sinus Quartus.
5. Torcular Herophili.
6, 6. The Lateral Sinuses.
7. Inferior Petrous Sinus.
8. Superior Petrous Sinus.
9. Circular Sinus of Ridley.
10. The two Occipital Sinuses.
11. Cavernous Sinus.
12. Internal Jugular Veins.
13. Veins of the Pia Mater.

its sides retained together by many little tendinous strings called the Chordæ Willisii or Trabeculæ; and the veins of the pia mater running into it obliquely forwards, and furnished with valves. In this sinus, and also under the dura mater near the top of the brain, are many small bodies of various sizes, the Glandulæ Pacchioni, from a line or less to three or four lines in diameter. One of the largest of these bodies on each side, near the parietal foramen, actually protrudes from the surface of the brain through the dura mater, and makes a deep pit into the parietal bone, near the sagittal suture. They have no excretory ducts that have been discovered, and it is uncertain whether any specific fluid is secreted by them.

From the posterior extremity of the longitudinal sinus proceeds on each side in the posterior margin of the tentorium, the Lateral Sinus, to terminate in the foramen lacerum posterius. The lateral and inferior veins of the cerebrum and the inferior veins of the cerebellum, run into the Lateral Sinus.

Fig. 58.

THE SINUSES OF THE BASE OF THE SKULL.



a. Circular Sinus.
b. Cavernous Sinus.
c. Ophthalmic Veins.
d. Superior Petrous Sinus.
e. Inferior Petrous Sinus.
f. Basilar Sinus.
g. Occipital Sinus.
h. Right Lateral Sinus.
i. Torcular Herophili.

At the inferior edge of the falx major, just above its concave edge and between its duplication, is the Inferior Longitudinal Sinus. And at the junction of the falx major and tentorium is the Sinus Quartus or Rectus, formed by the Inferior Longitudinal Sinus and a vessel from the interior of the brain called the Vena Galeni. The sinus quartus joins the superior longitudinal sinus at the internal occipital protuberance, where the general meeting of the vessels is called Torcular Herophili.

Around the pituitary gland, in the sella turcica, is the Circular Sinus of Ridley; and on each side of the sella turcica is the Cavernous Sinus. On the occiput, and about the petrous bone, there are several smaller sinuses, which, together with the circular and cavernous, empty into the lateral.

The Dura Mater is supplied with nerves from the sympathetic which are traced with some difficulty. Its principal artery is from the internal maxillary, and passes through the foramen spinale, making the deep arborescent indentations in the parietal bones. There are some other branches derived from the internal carotids and vertebrals. Some of the veins accompany the arteries, and discharge into the sinuses about the base of the cranium.

Within the dura mater, and covering the whole exterior surface of the pia mater, is the TUNICA ARACHNOIDEA, a delicate transparent membrane with no red vessels in its composition. It forms a uniform coat, not dipping into the convolutions of the encephalon, and may be seen distinctly on the superior surface of the brain like a shining smooth surface to the pia mater, but cannot readily be raised up from it. On the base of the brain, it is continuous with the tunica arachnoidea of the medulla spinalis. It lines the internal surface of the dura mater, in an analogous manner to that of the synovial membranes of the joints with the capsular ligaments, and secretes a lubricating fluid which facilitates the motions of the brain.

The PIA MATER is a tender and highly vascular membrane, lying in close contact with the brain, dipping into its convolutions and spread over the surface of its ventricles in a manner difficult to be understood without dissection. It is much thinner and more delicate in the cavities of the brain than exteriorly, and seems there more like a vascular network than a perfect membrane. By its course between the fornix and thalami it constitutes the Velum Interpositum or Tela Choroidea. It is highly useful in conducting vessels into the substance of the brain, by being so extensively spread over its surface, and by dividing them minutely before they penetrate it.

Its bloodvessels are exceedingly numerous, being received from the vertebral and internal carotid arteries at the basis of the cranium, in the manner which will be explained at the end of the chapter. Its veins are all introduced into the sinuses of the dura mater, and therefore do not accompany the arteries.

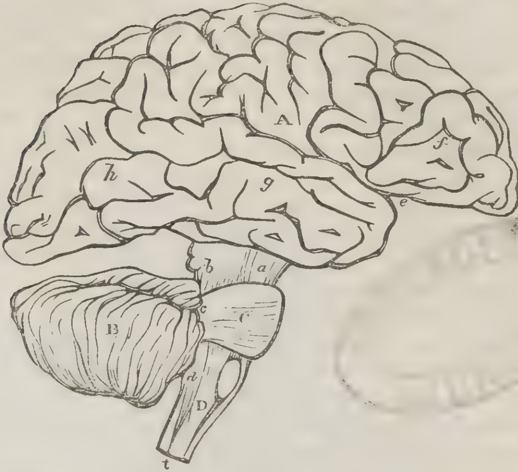
§ 2. THE CEREBRUM.

The *Cerebrum* weighs about three pounds, and is seven times as heavy as the cerebellum. It fills by far the greater part of the cavity of the cranium, and extends from the tentorium and anterior basis of the cranium to the vault of the latter. Above, it is partially divided by the falx major into two equal parts called Hemispheres, and below, we see that each of these hemispheres is subdivided into three lobes. The Anterior Lobe is placed upon the orbitar process of the frontal bone; the Middle Lobe is in the middle fossa of the base of the cranium; and the Posterior Lobe upon the tentorium. Between the anterior and middle lobes there is a deep indentation, the Sulcus, or Fissura Magna Sylvii, corresponding in position with the posterior edge of the little wing of the sphenoid bone, which prescribes their boundaries. The middle and posterior lobes are not so well separated from each other.

The external surface of the cerebrum is arranged into many convolutions (*Gyri*), which at a little distance give it the appearance of the intestines of a child. The pia mater, dipping down to the bottom of the Sulci between them, keeps their opposite faces in contact.

If a section be made into the brain, it will be seen to

Fig. 59.



A PLAN IN OUTLINE, SHOWING, IN A LATERAL VIEW, THE PARTS OF THE ENCEPHALON SEPARATED SOMEWHAT FROM EACH OTHER.

A. Cerebrum.
f, g, h. Its Anterior, Middle, and Posterior Lobes.
e. Fissure of Sylvius.
B. Cerebellum.
C. Pons Varolii.
D. Medulla Oblongata.

a. Crura Cerebri.
b. Superior.
c. Middle.
d. Inferior Peduncles of Cerebellum.
The parts marked *a b, c* C, form the Isthmus Encephali.

consist of matter of different colors and consistence. The external matter varies from a line to three or four in depth; is called the Cineritious or Cortical; is of a yellowish-red color; somewhat less consistent than the other; and covers all the convolutions. Within the cortical is the Medullary or Fibrous Matter, which is of a white color, with small spots or dots of red, owing to the bloodvessels.

By separating the hemispheres, we see that just below the edge of the falx major they adhere together by the pia mater of the opposite sides. Dissect this adhesion through, and a broad expansion of medullary matter, the Corpus Callosum, is seen extending from the anterior to the posterior edge of the falx, and marked in its centre by two white lines running longitudinally and slightly curved, with their convexities towards each other. Between these lines is a fossa called Raphé. Other lines, not so distinct, pass laterally and at right angles to the first two. By pulling the hemisphere still more from its fellow, we bring into view its edge, which laps over the corpus callosum, and is separated from it by a fissure running the whole length of the latter.

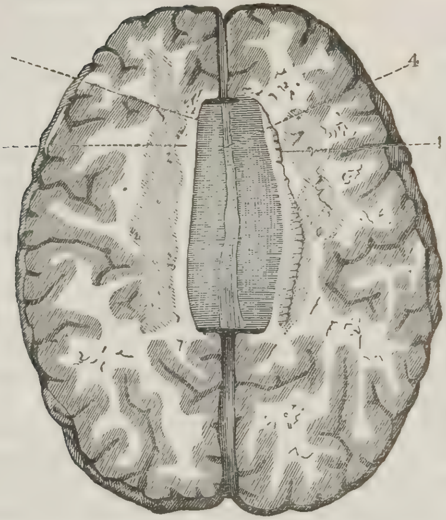
The Encephalon being looked upon by the best authorities of the present day as a development of the spinal marrow, may now be taken out of the head and studied from below upwards, instead of from above downwards. This method has the advantage of fixing on the mind the order of growth; but as it is difficult to demonstrate the parts in the recent state according to this plan, the following outline will, perhaps, sufficiently explain the order of appearances, whilst the continuance of the brain in the cranium will facilitate its dissection.

In proceeding with the anatomy of the brain from its base upwards, the following is the order of succession of parts in its structure. The Medulla Oblongata, the continuation of the Medulla Spinalis—the Pons Varolii on the top of the medulla oblongata; the Crura Cerebelli running off on each side to form the Cerebellum, and the two diverging trunks Crura Cerebri, in advance of the Pons, which run forwards and are lost in the medullary substance of the Cerebrum. On the upper surface of these are two protuberances; the posterior is the Thalamus Nervi Optici, and the anterior the Corpus Striatum. Each crus cerebri having penetrated into the substance of its respective hemisphere, expands by a multiplication of the filaments composing it, so as to constitute the principal bulk of the hemisphere. The filaments may be satisfactorily traced in almost every direction towards the periphery of the cerebrum, where they terminate in the convolutions, their extremities being covered by the cineritious matter there. The arrangement is best seen by scraping with a knife along the base of the brain, especially when the latter has been hardened in spirits of wine, and it is constituted by what are called the diverging fibres of the brain by Gall and Spurzheim. The point is not indeed entirely settled that the diverging fibres end in the convolutions, or rather do not afterwards inflect or double themselves, and pass onwards again to the middle line of the brain, forming by their convergence the Corpus Callosum. At all events, the fact is quite demonstrable that, as the lateral and under portions of the hemispheres consist in diverging fibres arising in and from the crus cerebri, so the upper portion and the corpus callosum consists in filaments which arise in the adjoining convolutions and collect towards the middle line of the corpus callosum, where they adhere to their congeners of the opposite side. The simplest illustration of this arrangement is given by folding a towel or strip of cloth double on itself, so as to convert it into a loop; the under part of the loop would be the diverging fibres of the cerebrum, and the upper part the converging fibres of the corpus callosum, it being recollected that the continuation of the two orders of fibres into one another in the brain is not so fully ascertained as is represented in this model. Between the two orders of fibres there is a horizontal cleft or interval. This interval is the lateral ventricle, which may be got into, under the posterior margin of the corpus callosum, from its being open there, or rather only closed by an adhesion of the membranes, which is easily lacerated.

The details of the brain may now be learned by removing the hemispheres above the corpus callosum, with a sharp knife, whereby a view is got of the Centrum Ovale of Vieussens, and also of the connection formed between the hemispheres by the corpus callosum. The Centrum Ovale is, properly speaking, the oval nucleus of medullary matter which is left when the cortical is scraped or cut away, but is most commonly described as the oval disk which is formed by the aforesaid section. The corpus callosum is placed in its middle, and forms the great medullary commissure between its two sides, and also the roof of the lateral ventricles.

By removing the corpus callosum, the Lateral Ventricles, one on each side, are brought into view. They are horizontal cavities or fissures of an extremely irregular shape, in the very centre of the hemispheres; being the

Fig. 60.



Horizontal Section of the Cerebrum upon a Level with the Corpus Callosum.

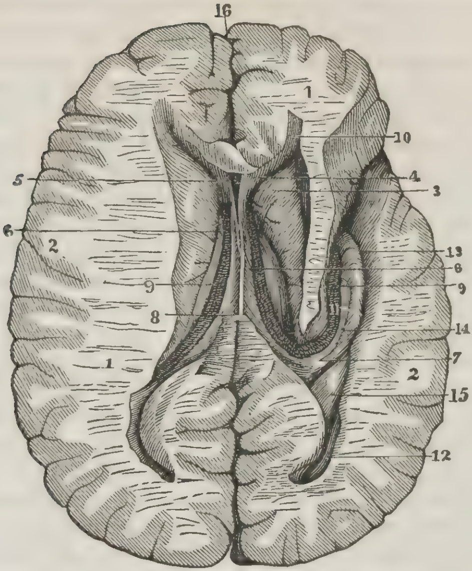
1. Outer Edge of the Corpus Callosum, formed by pressing aside the Medullary Substance of the Hemisphere.
2. Medullary or Fibrous Substance.
3. Upper Surface of the Commissure.
4. Raphé.

[The fibres of the Corpus Callosum are erroneously represented in the cut—they should be shown as transverse instead of longitudinal.]

interval between the diverging and converging filaments of the cerebrum, and consist each of a central portion or body, and three processes or cornua, which extend from the anterior to the posterior portions of the hemispheres. In the anterior lobe is the Anterior Cornu, separated only by the Septum Lucidum from its fellow. In the middle lobe is the Inferior or Middle Cornu passing in a winding direction downwards and forwards, and in the posterior lobe is the Posterior Cornu, also called Digital Cavity.

In the anterior part of the lateral ventricle is the Corpus Striatum, a long convex body, broad before, and coming to a point behind; it is cineritious or cortical externally, and medullary within; when scraped, the lat-

Fig. 61.



A Transverse Section of the Brain, showing the Corpora Striata, Lateral Ventricles, and the Associated Parts.

1, 1. Medullary portion of the Hemispheres.
2. Vesicular Neurine or Cortical Portion.
3. Corpus Striatum.
4. Septum Lucidum.
5. Ventriculus Septi or Fifth Ventricle.
6, 6. The Fornix.
7. Posterior Crura of the Fornix.
8. Base of the Fornix.
9, 9. Plexus Choroides, at the Margin of the Velum Interpositum.
10. Anterior Cornu of the Lateral Ventricle.
11. Middle or Descending Cornu.
12. Posterior Cornu.
13. Hippocampus Major.
14. Tænia Hippocampi.
15. Hippocampus minor.
16. Longitudinal Fissure of the Brain.

ter looks fibrous. At the posterior part of the corpus striatum is the Thalamus Nervi Optici, a large convex body, the surface of which is medullary, and the interior cortical; it has a node or tubercle (Tuberculum Anterius) on its upper anterior face, and three on its posterior side; they are of different sizes in different subjects, and called Tuberculum Posterius Superius, Corpus Geniculatum Internum, and Corpus Geniculatum Externum. Between the thalamus and the corpus striatum in the angle formed between the internal margin of the corpus striatum, and the external one of the thalamus opticus is a streak of medullary matter called Tænia Striata.

In the posterior cornu of the-lateral ventricle is a rising, called Hippocampus Minor, or Ergot, from its resemblance to a cock's spur; and in the inferior cornu is a larger rising, the Hippocampus Major or Cornu Ammonis, passing to its bottom and increasing in breadth as it descends. Its lower end terminates by two or three tubercles which give it the appearance of a claw, being called, from that cause, Pes Hippocampi.

A considerable part of the Thalami Nervorum Opticorum is concealed by the Fornix. This is a triangular arched body of medullary matter, narrow before and broad behind, and extending from the anterior to the posterior extremity of the thalami. It commences forwards by two crura (Crura Fornicis Anteriora), very much curved, with their concavity backwards, and which arise deeply from the sides of the thalami, near their union with the corpora striata. These crura come afterwards into contact, increase much in breadth, conceal the thalami, and form the fornix, which posteriorly is lost in the back of the corpus callosum and the hippocampi majores. The angle formed by the back and lateral margins is elongated, and accompanies the hippocampus major for some distance, in the form of a thin crus, which is easily demonstrated by raising it on the knife-handle. This crus is the Corpus Fimbriatum of the Lateral Ventricle, or Tænia Hippocampi. The under surface of the fornix is generally called Lyra, on account of the striated under surface, though this is erroneous.

The Septum Lucidum is a partition, fixed between the lateral ventricles at their fore part, and extends from the corpus callosum above to the fornix below. It is of an irregular triangular shape, formed of two laminæ, placed side by side with a cavity between them at their front, called the fifth ventricle. To get a good view of the septum lucidum, it should be examined as the corpus callosum is raised up. In many subjects, particularly when there has been a small dropsical effusion into the ventricles, the septum looks like a continuation of the middle of the fornix, a lamina of it being contributed by the internal margin of each crus.

Under the fornix and lining the cavities of the lateral ventricles, as well as the other ventricles, is placed a delicate reflection of pia mater, with many vessels in it, but so very thin that it can scarcely be raised up as a perfect membrane. This membrane gets into the lateral ventricles from the fossa of Sylvius and under the back of the corpus callosum. Along the hippocampus major and the exterior margin of the fornix, on each side, is placed a fold of it quite loose and floating, which consists of a great congeries of small veins and arteries. This fold is the Plexus Choroides, which becoming smaller anteriorly, dips under the anterior crus of the fornix, and its veins unite into a large trunk which runs under the fornix to terminate posteriorly in the Vena Galeni. That portion of the pia mater lying under the fornix and bounded on each side by the plexus choroides, being a more complete membrane, is called the Velum Interpositum, or Tela Choroidea.

The fornix should now be raised with the velum interpositum, by cutting through its anterior crura and turning it backwards, which gives a more perfect view of the thalami. From these bodies on the opposite sides being in contact, a kind of junction, the Commissura Mollis, is formed by their convexities. Anterior to this junction, is a triangular space called Vulva. It is here that the lateral ventricles communicate, under the anterior crura of the fornix, with the third ventricle. This communication is the Foramen of Monro. Behind the commissura mollis is a similar triangular space, the Anus. The Third Ventricle is now brought fully into view by separating the thalami, and we shall find that it is a narrow oblong cavity bounded below by the pons tarini crura cerebri and emminentia mammillares, and above by the velum interpositum and fornix. At its lower front part below the anterior commissure is an open way, the Iter ad Infundibulum, leading to the basis of the brain, and at its

Fig. 62.

A Section of the Cerebrum, showing the Upper Surfaces of the Corpora Striata and Optic Thalami, the Cavity of the Third Ventricle, and the Upper Surface of the Cerebellum.

a, e. Tubercula Quadrigemina.
a. Nates.
e. Testis.
b. Commissura Molis.
e. Anterior Extremity of the Corpus Callosum cut.
f. Crura of the Fornix.
g. Anterior Horn of Lateral Ventricle.
k, k. Corpora Striata.
l, l. Thalami Optici.
z to *s.* Third Ventricle.
In Front of *z*, is the Anterior Commissure.
s. Posterior Commissure.
p. Pineal Gland with its Peduncles.
n, n. Processus e Cerebello ad Testes.
m, m. Hemispheres of the Cerebellum.
h. Superior Vermiform Process.
i. Notch between the Hemispheres of the Cerebellum behind.

posterior part, just below the posterior commissure, is the aqueduct of Sylvius, or the Iter e Tertio ad Quartum Ventriculum.

The Tubercula Quadrigemina, or Nates and Testes, are situated on the superior face of the Crura Cerebri, just behind the thalami, the nates being above. They are each about three or four lines in diameter; consist of medullary matter externally, and cineritious within; and constitute a means of communication between the cerebrum and cerebellum by being united to the valve of the cerebellum; also called the Valve of Vieussens, which is inserted into the lower part of the Testes.

The Pineal Gland is a small conoidal cineritious body, of a reddish color, found on the top of the nates. It is commonly four lines in its longest diameter, and contains a small quantity of calcareous matter, feeling and looking like fine sand, which, however, is occasionally collected into one or more irregular masses of a line in diameter. This sandy matter is the Acervulus Cerebri that appears about the sixth year of life, and continues forever afterwards. The pineal gland is situated between the nates and the back of the fornix, being closely connected with the under surface of, and surrounded by the velum interpositum, so that, most frequently, when this membrane is raised along with the fornix the pineal gland is torn from its place. If we are careful to avoid this accident, we shall find, passing along the upper internal face of the thalami, on each side, above the commissura mollis, a medullary streak, the Peduncle of the pineal gland, which goes from the latter to the anterior crus of the fornix.

At the anterior part of the third ventricle, just below the crura fornicis, and seen between their curvature where they diverge, is the Commissura Anterior, a medullary band like a nerve, near the corpus striatum, and passing from the lower anterior part of one thalamus to the other. At the back part of the third ventricle, just under the pineal gland, is the Commissura Posterior, passing also from one thalamus to the other, and being a semicylindrical fold of medullary matter.

The Valve of Vieussens is seen by cutting off the posterior lobes of the cerebrum, removing the tentorium, and dissecting away the pia mater, just behind and below the tubercula quadrigemina. It passes up as a broad lamina of medullary matter an inch wide, from the central part of the cerebellum to the inferior portion of the testes. By introducing a probe from the third ventricle through the aqueduct of Sylvius, it will be seen that this valve forms the roof of the fourth ventricle, and that it is thinner in its middle than on either side.

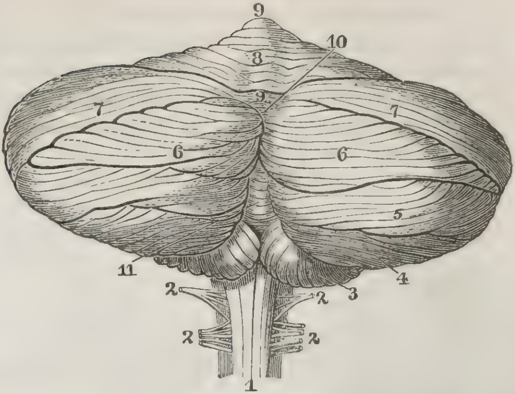
The farther examination of the Encephalon should be prosecuted by detaching it from the basis of the cranium and turning it out, the nerves being left as long as possible, and the spinal marrow also. When inverted, it has the following parts uppermost: The anterior and the middle lobes of the Cerebrum; the two hemispheres or lobes of the Cerebellum; the pons Varolii or Tuber Annulare; and the Medulla Oblongata.

§ 3. THE CEREBELLUM.

The CEREBELLUM is remarkable for the difference between its size and that of the Cerebrum, as it occupies only the space between the tentorium and the posterior fossæ of the basis of the cranium. It is divided into two hemispheres or lobes by the falx minor. Though covered by the same membranes, its appearance differs from that of the cerebrum, in consequence of its convolutions being straight and thin, and resembling horizontal laminæ. The latter are separated by fissures penetrating from four to twelve lines, and thereby increasing the surface for the entrance and exit of the vessels. The upper surface of the cerebellum is slightly convex, corresponding with the concavity of the tentorium. The under surface has a double convexity corresponding with the double concavity in the inferior part of the occipital bone. The upper central part of it, just above the fourth ventricle, is called Vermis Superior, the anterior extremity of which is called the Monticulus Cerebelli, from its elevation; and when the two hemispheres are separated below, a prominence like a third lobe is seen between them, which is the Vermis Inferior. This central part of the cerebellum is the fundamental portion of Gall.

When the cerebellum is cut into, the medullary matter is found principally in its centre, and sends off processes in every direction into the cortical. From this circum-

Fig. 63.



A Posterior View of the Cerebellum, and the several Lobules of which it is composed. (After Solly.)

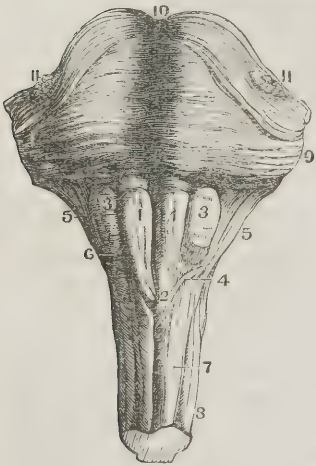
1. Spinal Cord.
2. Posterior Spinal Nerves.
3. Amygdaloid Lobule.
4. Lobulus Pneumogastrici.
5. Lobulus Gracilis.
6. Inferior Semilunar Lobe.
7. Superior Semilunar Lobule.
8. Lobulus Quadratus.
9. Superior Vermiform Process.
10. Vermis Inferior.
11. Monticulus.

stance, the medullary matter has an arborescent outline upon all vertical sections made into the cerebellum, and has obtained the name of Arbor Vitæ, which is merely expressive of this arrangement without designating any particular part of it. If horizontal cuts be made, the arbor vitæ resemblance is not manifested, and the proportion of medullary matter appears more considerable. The two Crura of the Cerebellum, one on a side, pass from the medullary portion, being in fact a mere continuation of the latter. They are separated from each other by the fourth ventricle, and are lost in the posterior upper part of the Pons Varolii. In their centre is a denticulated oval ring of cineritious matter, called Corpus Dentatum, or Rhomboideum.

The Medulla Oblongata, also called Bulbus Rachidicus, is that portion of encephalic substance which extends from the middle of the basilar process of the os occipitis to the superior margin of the first cervical vertebra. Being a continuation of the medulla spinalis, it becomes gradually larger as it ascends, and is about one inch long. On its under surface, it is divided longitudinally by the middle fissure, which is continuous with that on the front of the medulla spinalis.

Fig. 64.

Anterior Aspect of the Medulla Oblongata.



1. Corpora Pyramidalia.
2. The Point of their Decussation.
3. Corpora Olivaria.
4. Fibres that run from the Anterior Column of the Medulla Spinalis to the Cerebellum.
5. Corpora Restiformia.
6. Arciform Fibres.
7. Anterior Columns.
8. Lateral Columns.

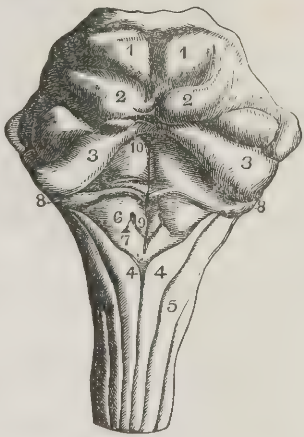
9, 10. Pons Varolii.

11. Roots of the Trigeminus Nerve.

On each side of this fissure is an oblong eminence, called Corpus Pyramidale, coming to a point below, and disappearing gradually. On the outer side of that again, and separated from it by a fissure on the side of the medulla oblongata, is an ovoidal and still more prominent convexity, but not so long, called Eminentia Olivaris. And on the outside of this is another and smaller eminence, the Corpus Pyramidale Laterale, or Corpus Restiforme. The Medulla Oblongata consists of medullary matter externally, and has some cineritious internally. By lifting it up from the cerebellum, and dissecting away the tunica arachnoidea and pia mater, a good view may be got of the Fourth Venticle of the brain, which is closed below and separated from the spinal canal by these membranes. It will now be easy to understand that the parietes of the fourth ventricle are formed by the Valve of Vieussens and by the Cerebellum, above and posteriorly; by the Pons Varolii anteriorly; by the Medulla Oblongata below; and by the Crura Cerebelli laterally. The superior face of the medulla is excavated between the Corpora Restiformia, and marked by an arrangement of its surface corresponding in some measure with the slit and nib of a writing-pen, from which it has been named the Calamus Scriptorius.

Fig. 65.

MEDULLA OBLONGATA AND PONS VAROLII, THE CRURA OF THE CEREBELLUM BEING CUT SHORT.

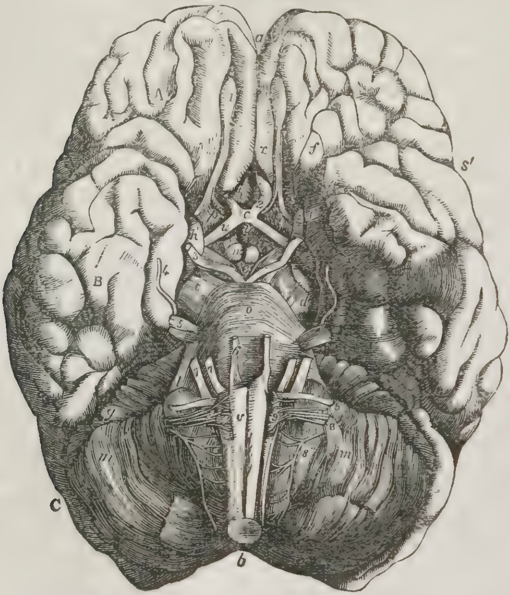


1. Testes.
2. Nates.
3. Superior Peduncles of the Cerebellum.
4. Posterior Pyramids.
5. Corpora Restiformia.
6. Fasciculi Teretes on floor of 4th Ventricle, on each side of the Longitudinal Fissure.
7. Roots of the Auditory Nerve.
8. Prominence connected with the Hypoglossal Nerve.
9. Posterior Fissure, or Calamus Scriptorius.
10. Floor of the Fourth Ventricle.

The PONS VAROLII is the large projecting body placed at the top of the medulla oblongata, upon the junction of the body of the sphenoid bone with the basilar process of the os occipitis, between the anterior part of the cerebellum and the posterior part of the middle lobes of the cerebrum. It is hemispherical on its inferior surface—about an inch in diameter, and divided into two halves by a superficial middle longitudinal fossa, with transverse medullary fibres passing from it on each side, which come from the Crura Cerebelli. In its substance is much cine-

Fig. 66.

BASE OF THE BRAIN. A, ANTERIOR, B, MIDDLE, AND C, POSTERIOR LOBES OF THE CEREBRUM.



a. Fore part of the Longitudinal or Inter-Hemispheric Fissure.

b. Notch between the Hemispheres of the Cerebellum.

c. Optic Commissure.

d. Left Crus Cerebri.

e. Lobus Perforatus Lateralis.

e to *i.* Inter-crural Lamina.

ff. Convolution of the Fissure of Sylvius.

i. Infundibulum.

l. Right Crus Cerebelli.

m, m. Hemispheres of the Cerebellum.

n. Eminentia Mamillaria.

o. Pons Varolii, forming by its continuation on each side the Crus Cerebellum.

p. Pons Tarini.

q. Horizontal Fissure of the Cerebellum.

r. Gray Tuber.

s, s. Fissure of Sylvius.

t. Left Crus of the Cerebrum.

u, u. Optic Tracts.

v. Medulla Oblongata.

x. Marginal Convolution of the Longitudinal Fissure.

1. Olfactory Nerve.
2. Optic.
3. Motor Occuli.
4. Trochlearis or Patheticus.
5. Trigeminal or Trifacial.
6. Motor Externus.
7. Facial.
7. Auditory.
8. Glosso-Pharyngeal.
8. Pneumogastric.
8. Spinal Accessory.
9. Hypoglossal.

ritious matter blended with medullary, the latter being arranged in striæ which run in different directions and may be traced to the Crura Cerebri.

In advance of the Pons Varolii, and springing from it, are two diverging medullary trunks, one on each side, which run forward and are lost in the medullary matter of the Cerebrum. These trunks are the Crura Cerebri. They are rounded below, about eight lines long and ten in their vertical diameter, diverge mutually from their roots, and are separated by a deep fissure which is considered as a repetition of that on the front of the Medulla Oblongata. Each crus presents on its surface a medullary layer, to which succeeds a parcel of cineritious matter, which, on being removed, is followed by a mixture of both cineritious and medullary matter, more abundant than either of the preceding.

Between the Crura Cerebri, at their anterior part, are two small, round bodies, three lines thick, in contact with each other and about the size of a French pea; they are the Corpora Albicantia or Eminentiæ Mamillares, and are formed of medullary matter without and cortical within.

The Pons Tarini, or Tuber Cinereum, is a portion of the under surface of the crura cerebri, at the floor of the third ventricle. It is continuous in front with the anterior margin of the Corpus Callosum.

The Infundibulum is a flat funnel-shaped tube alluded to in the account of the third ventricle, but best seen in this period of the dissection. It is placed just before the corpora albicantia, and passes from the third ventricle to the pituitary gland, having its apex in contact with the latter, and its broad part opening into the ventricle. It is generally impervious at its apex. It is cineritious externally, which gives it a red cast, and medullary internally.

The Glandula Pituitaria occupies the sella turcica, and is somewhat spherical, being about six or seven lines in diameter. Its structure is firm and resisting, formed of a tough cineritious matter externally, and of a kind of medullary internally. It is almost concealed by a close reflection of dura mater over it.

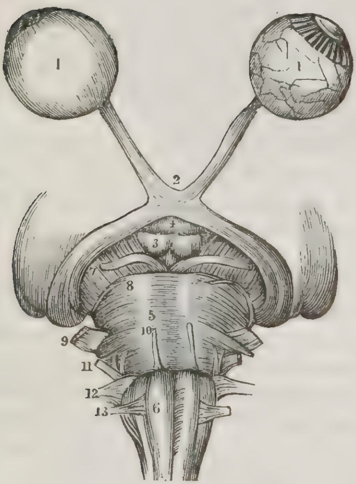
§ 4. NERVES OF THE BRAIN.

There are Nine pairs of nerves going from the basis of the brain, and named numerically by beginning in front.

The 1st Pair, the OLFACTORY (NERVI OLFACTORII), appropriated to the nose, arise by three medullary striæ from the base of the brain at the corpora striata, in the

Fig. 67.

THE OPTIC NERVE WITH ITS CHIASM AND TRACT, TOGETHER WITH THE ORIGINS OF SEVEN OTHER PAIRS OF CEREBRAL NERVES.



1, 1. Globe of the Eye; the one on the Left Hand is perfect, but that on the Right has the Sclerotic and Choroid removed to show the Retina.
2. The Chiasm of the Optic Nerves.
3. The Corpora Albicantia.
4. The Infundibulum.
5. The Pons Varolii.
6. The Medulla Oblongata, the figure being on the Right Corpus Pyramidale.
7. The Third Pair, or Motores Oculi.
8. Fourth Pair, Pathetici.
9. Fifth Pair, Trigemini.
10. Sixth Pair, Abducentes, or Motor Externus.
11. Seventh Pair, Auditory and Facial.
12. Eighth Pair, Pneumogastric, Spinal Accessory, and Glosso-Pharyngeal.
13. Ninth Pair, Hypoglossal.

fissure of Sylvius, and make their appearance on the back and inferior part of the anterior lobes. Their structure is soft and pulpy, and they are protected from the weight of the brain by being deposited in a triangular groove formed by a convolution. They swell out into bulbs at their fore part on the sides of the crista galli, and perforate the cribriform plate of the ethmoid bone by numerous filaments. They get a coat from the dura mater which gives them great strength, and are then distributed as mentioned in the account of the nose.

The 2d Pair, the OPTIC NERVES (NERVI OPTICI), are of considerable magnitude, and differ somewhat in their texture from the other nerves in consequence of having a general investment of pia mater before it surrounds their particular fasciculi; and also from having more medullary matter in them. They arise from the posterior end of the thalami and from the testes, and make their appearance between the middle lobes and the crura cerebri. There is a very close intertexture of the nerves of the opposite sides just before the infundibulum, so that it is a question whether they decussate each other, or simply unite. This junction presents the shape of the letter X, and is called the Chiasm or Crossing of the Optic Nerves. Being the nerves of vision, they pass to the ball of the eye, through the foramina optica, and are expanded into the retina.

The 3d Pair (MOTORES OCULORUM) arise from the inner margins of the crura cerebri near the pons varolii by several filaments. They pass outwards and penetrate the dura mata near the posterior clinoid process, and traversing the upper part of the cavernous sinus they get into the orbits through the foramen sphenoidale. They are distributed to the muscles of the eye, except the obliquus superior and rectus externus, and contribute to the ophthalmic ganglion.

The 4th Pair (TROCHLEARES) each arise by two filaments, which quickly unite, from the valve of Vieussens just below the testes. It is the smallest cranial nerve, not larger than a common sewing-thread; it makes its appearance at the anterior lateral margin of the pons varolii. It penetrates the edge of the tentorium not far from the entrance of the third nerve, and running in an investment of dura mater through the cavernous sinus at the outer side of this nerve, it afterwards crosses it above, and getting into the orbit through the foramen sphenoidale, is appropriated to the trochlearis or superior oblique muscle.

The 5th Pair (TRIGEMINI) are the largest of all. Each arises by three portions, the middle being largest, from the side of the tuber annulare just where it is blended with the crus cerebelli. Their fibres may be traced through the pons into the posterior column of the medulla oblongata, and are collected into one cord, which passes into a canal of the dura mater, lying on the anterior part of the petrous bone. They are not connected to the canal except at its lowest part, where they receive a coat from it. The nerve is then extended, like a fan, into seventy or eighty filaments. At the lower end of the latter is a brownish substance, called the ganglion of Gasser, formed principally upon the middle root of the Trigeminus. The nerve then passes off in three great divisions, named from their appropriations: 1. The Ophthalmic nerve, which goes out of the cranium at the foramen sphenoidale of the orbit; 2. The superior Maxillary, at the foramen rotundum; and 3. The Inferior Maxillary, at the foramen ovale. Its general distribution is to the orbit, the face, and the tongue.

The 6th Pair (MOTORES EXTERNI). Each nerve arises from the commencement of the medulla oblongata in the base of the corpus pyramidale, its root being frequently overlapped by the pons. It passes forward through the dura mater, in a canal, of the cavernous sinus, on the inside of the fifth nerve, and, lying between this nerve and the carotid artery, it detaches one or more filaments to form the commencement of the sympathetic nerve, which accompanies the carotid artery through the carotid canal to the neck. The trunk of the motor externus then gets into the orbit through the foramen sphenoidale, and is appropriated to the rectus externus muscle of the eye.

The 7th Pair is composed of two nerves, the PORTIO

MOLLIS and the PORTIO DURA. The first arises from the posterior face of the medulla oblongata, at the calamus scriptorius and corpus restiforme, being separated from its fellow of the opposite side by the slit of the calamus scriptorius. The second, or portio dura, arises from the superior part of the corpus restiforme behind, near the pons. A third nerve, which at a little distance joins the portio dura, and is a mere fibril of it called portio Media, arises near the latter. The seventh nerve, thus constituted of a hard and of a pulpy portion, dips into the meatus auditorius internus. The mollis goes to the ear and is spent upon the labyrinth; the dura, passing along the aqueduct of Fallopius, gets out at the stylo-mastoid hole and goes to the face.

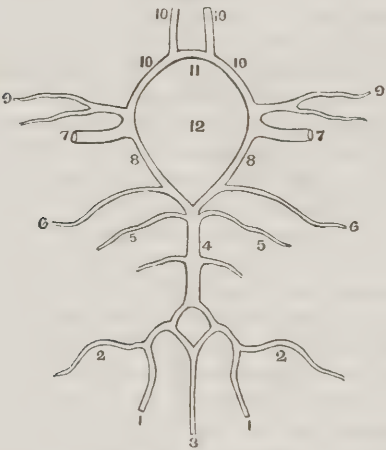
The 8th Pair consists of three portions having different destinations: The Glosso-Pharyngeal; The Par Vagum or Peumogastric; and the Spinal Accessory nerve of Willis. The first two arise near each other behind the Corpora Olivaria from the side of the Medulla Oblongata. The Glosso-Pharyngeal is before the other, and consists of one cord. The Par Vagum is composed of several fasciculi having a flattened appearance, which afterwards unite together. The Spinal Accessory has a remarkable origin from the posterior fasciculus of the Medulla spinalis, occasionally as low down as the seventh cervical nerve. Its fibres successively form a round trunk, which, passing up the spinal canal and then into the cavity of the cranium through the foramen magnum, is associated with the nerves just mentioned; it is assisted also by contributions from the side of the Medulla Oblongata. The eighth pair passes out of the cranium at the posterior foramen lacerum, anterior to the internal jugular vein, and separated from it by a spine of bone as well as by a process of dura mater. The distinction of the nerves from each other is also kept up here, by processes of dura mater between them. They adhere on the outside of the cranium and then part for their different destinations; the Glosso-pharyngeal for the tongue and pharynx, the Par Vagum for the lungs and stomach, and the Spinal Accessory for the muscles and integuments of the neck.

The 9th Pair (HYPOGLOSSI). Each nerve arises from the side of the medulla oblongata in the groove, between the corpus pyramidal and olivare, by three or four fasciculi. These fasciculi unite into a trunk, which gets from the cranium through the anterior condyloid foramen, and is distributed to the tongue.

§ 5. OF THE BLOODVESSELS OF THE BRAIN AND SPINAL MARROW.

The brain is supplied by the Internal Carotids and the Vertebral Arteries. The former, passing in a very tortuous manner through the canal in the temporal bones, appear in the cavernous sinus at the sides of the anterior clinoid processes. They there send off, each anteriorly,

Fig. 68.



CIRCLE OF WILLIS.

1, 1. Vertebral Arteries.
2, 2. Inferior Cerebellar Arteries.
3. Anterior Spinal Artery.
4. Basilar Artery.
5, 5. Superior Cerebellar Arteries.
6, 6. Posterior Cerebral Arteries.
7. Internal Carotid.
8, 8. Posterior Communicating Branches.
9, 9. Middle Cerebral Arteries.
10, 10. Anterior Cerebral Arteries.
11. Anterior Communicating Artery.
12. Circle of Willis.

the ophthalmic artery through the optic foramen, and, in a short space afterwards, the Arteria Communicans Posterior, a branch which goes backwards to join the posterior artery of the cerebrum; the main trunk is continued into the fissure of Sylvius, and forms the Arteria Media Cerebri, and from this is sent off the Arteria Anterior which supplies the anterior lobe of the brain and the corpus callosum. The arteria anterior communicates by a short transverse branch, the Communicans Anterior, with its fellow.

The Vertebral Arteries come up through the foramen magnum, and unite with each other at the posterior part of the pons varolii, to form the basilary artery.

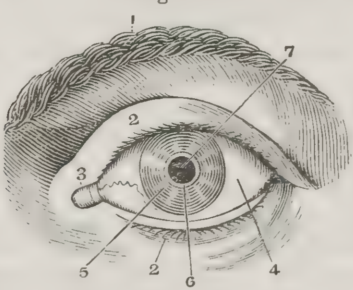
SECTION III.

OF THE EYE.

The hairs on the superior edge of the orbit are called SUPERCILIA, and those on the edges of the eyelids, the CILIA.

The Orbicularis Palpebrarum muscle being removed, immediately beneath it are the two TARSI CARTILAGES,

Fig. 69.



EYE OF THE NATURAL SIZE AND STATE.

1. Supercilia.
2. Upper and Lower Lids and Cilia.
3. Inner Canthus and Caruncula Lachrymalis.
4. Cornea.
5. Iris.
6. Inner and Circular Fibres of the Iris—the *sphincter iridis* muscle.
7. Pupil.

which form the margin, and a considerable part of the breadth of the upper and the lower eyelid. The upper cartilage is of a semi-oval figure, the broadest part being not quite half an inch; the lower cartilage is of a uniform breadth, not exceeding in any part one-fourth of an inch. Their external extremities are united with each other, and kept in their places by a ligamentous expansion (*Ligamentum palpebrale externum*), connecting them with the orbitar margin of the malar bone, and internally they are fixed to the nasal process of the superior maxillary bone, by the tendon (*Ligamentum palpebraleinternum*), which affords origin, in part, to the orbicularis palpebrarum. The edge of these bodies is slanting, so that a groove is formed posteriorly where they are in contact, by which the tears are conducted to the inner corner of the eye. Near the internal extremity of each, but not in the cartilage itself, is to be found, in the centre of a small eminence, a foramen, the Punctum Lachrymale, capable of receiving a bristle, and being the orifice of a canal, the Ductus or Canaliculus Lachrymalis, which conveys the tears into the Sacculus Lachrymalis.

On the posterior surface of the tarsi cartilages, are placed several white tortuous canals in contact with each other, and having their extremities on the edges of the eyelids; they are the Glands of Meibomius, and secrete an unctuous substance. In the upper lid there are about thirty, and in the lower about twenty.

At the internal junction of the eyelids is placed the Caruncula Lachrymalis, a small granulated body, inferior in size to a grain of wheat, and of a glandular structure, for secreting an unctuous fluid.

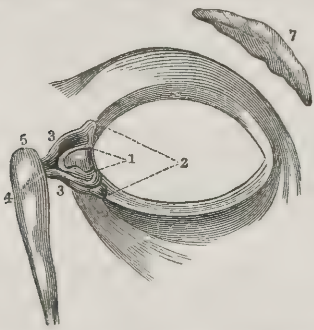
The lids are connected to the ball of the eye, by a delicate, vascular, and highly sensible membrane, the Tunica Conjunctiva, which is spread over the anterior third of the eye, not excepting the cornea; but there it becomes perfectly transparent. At the inner surface of the eye, the conjunctiva is thrown into a fold, the Plica Semilunaris, corresponding with the membrana nictitans of some animals.

The LACHRYMAL DUCTS (Canaliculi Lachrymales), are under the skin of the internal canthus, are from five to six lines long, and terminate by separate foramina in the sacculus lachrymalis. There is a sort of flap of the internal membrane of the sac which falls over these orifices.

The LACHRYMAL SAC occupies all the concavity in the os unguis, and extends from a short distance above the tendon of the orbicularis muscle, to the cavity of the nose under the anterior part of the inferior spongy bone; it is contracted to the size of a small crow-quill at its nasal extremity, and there has the name of Ductus ad Nasum. A duplicature of the membrane of the nose, resembling a valve, is frequently found at the orifice below.

Fig. 70.

ANTERIOR VIEW OF THE LACHRYMAL APPARATUS.



At the Inner Canthus are the Puncta, 1, and Canaliculi, 2, with the Caruncula between them.

The Lachrymal Sac forms the Upper Third of the Vertical Tube, 5, 6; and the Nasal Duct the remainder.

These parts are separated within by a fold of the lining membrane.

The LACHRYMAL GLAND, for the secretion of tears, is placed in the superior and external part of the orbit, near its margin; it is about ten-twelfths of an inch long, and half an inch wide, being flattened so as to suit the parts with which it is in contact. It is placed on the outer side of the tunica conjunctiva, and sends six or seven small ducts through it, whose orifices are in the tunica conjunctiva of the upper eyelid, near the external junction of the tarsi cartilages. It is divided into an anterior and posterior lobe by a small ligamentous band, attaching it to the depression of the os frontis.

The muscles in the orbit are as follow:—

1. Levator Palpebræ Superiosis arises near the superior margin of the optic foramen, and is inserted into the upper margin of the superior cartilage of the eyelid. Use, to draw the lid upwards.

2. Levator Oculi, or Rectus Superior, arises from the superior margin of the optic foramen, and is inserted into the upper part of the ball of the eye near the cornea, by a flat tendon. It turns the cornea upwards.

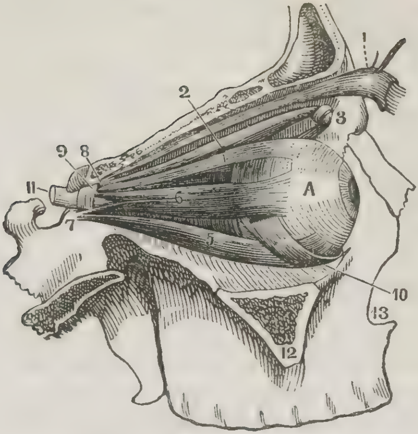
3. Depressor Oculi, or Rectus Inferior, arises from the inferior margin of the optic foramen, and is inserted into the lower part of the ball of the eye near the cornea. It draws the cornea downwards.

4. Adductor Oculi, or Rectus Internus, arises from the internal margin of the optic foramen, and is inserted into the internal part of the ball of the eye near the cornea. It draws the cornea inwards.

5. Abductor Oculi, or Rectus Externus, arises from the external margin of the optic foramen, and is inserted into the external part of the ball of the eye. It turns the cornea outwards.

6. Obliquus Superior arises from the internal margin of the optic foramen, runs along in contact with the orbitar plate of the os frontis, passes through the trochlea, near its internal angular process, and, being inclosed in a sheath sent off from the trochlea, its round tendon is inserted about half-way between the cornea and optic nerve in the superior part of the eyeball. It turns the eye on its axis.

Fig. 71.



A Side View of the Muscles of the Eyeball.

A. Ball of the Eye.
1. Levator Palpebræ Superioris.
2. Obliquus Superior, or Trochlearis Muscle.
3. Trochlea of the last-named Muscle.
4. Rectus Superior Muscle.
5. Rectus Inferior "
6. Rectus Externus "
7. Ligament of Zinn.
8. Origin of the Superior Oblique Muscle.
9. Origin of the Rectus Externus.
10. Obliquus Inferior Muscle.
11. Optic Nerve.
12. Malar Bone, divided.
13. Upper Maxillary Bone.

7. The Obliquus Inferior arises from the orbitar plate of the superior maxillary bone near the os unguis, and is inserted into the outer part of the eyeball, half-way between the cornea and optic nerve. It turns the eye on its axis.

8. The Tensor Tarsi [of Horner]. At the internal canthus of the orbit is a small muscle belonging to the internal commissure of the eyelids.

This muscle is about three lines broad and six lines long; it arises from the posterior superior surface of the os unguis near its junction with the os planum, and passes forwards and outwards, lying on the posterior face of the lachrymal ducts. As it approaches the commissure of the lids, it splits into two nearly equal parts, each of which is appropriated to a duct, and inserted along its course almost to the punctum lachrymale.

To get a distinct view of it, the eyelids must be separated from the eye and turned over the nose, leaving the tendinous attachment of the orbicularis and ciliaris muscle. The valvula semilunaris being brought into sight by this process, must be dissected away, and also the fat and cellular membrane underneath it. The muscle will now be seen, and, by passing bristles through the lachrymal ducts, its connection with them rendered evident, at the same time that we get a good idea of its size, origin, and insertion. While making this inspection, by turning the muscle somewhat aside, we shall be rendered sensible of another fact, of some importance, that the attachment of the inner commissure of the eyelids to the internal canthus of the orbit, is imperfectly described, even in the accounts of anatomists of much minuteness. It is attributed exclusively to the tendon of the orbicularis muscle, so much so that, in the operation for fistula lachrymalis, we are strictly enjoined not to cut through the tendon, lest a puckering of the eyelids be produced, by their line of extension being destroyed. The fact, on the contrary, is, that a ligamentous matter behind this tendon passes between the internal ends of the eyelids and the posterior flat surface of the os unguis, so that, admitting the tendon of the orbicularis to be cut through, this ligament, assisted by the little muscle described, would prevent the dreaded deformity. The internal extremity of this posterior ligament is at least half an inch from the insertion of the orbicularis tendon into the nasal process, and it brings the eyelids into the curve commonly seen at their junction. The lachrymal ducts are involved in this posterior ligament, passing along it into the sac, instead of going along the edges of the commissure just under the skin, as commonly described.

The muscle described must influence considerably the position of the puncta lachrymalia, by drawing them towards the ball of the eye, and keeping them in close contact with it; it is, therefore, a very efficient means for regulating, so far, the lachrymal passages and for securing the course of the tears. I am indebted to the late Dr. Physick, for a farther suggestion in regard to its use, which appears highly probable. In cases of extreme emaciation, it is well known that the adipose matter around the ball of the eye, is more or less absorbed, causing the eye to sink deeper into the orbit, and consequently to retire somewhat from the lids. The effect of this muscle is to draw the lids backwards and to keep them applied on the ball. Again, in the elevation of the upper lid, or rather the drawing of it within the orbit by the levator palpebræ, the tendency of the margin of the lid is to leave the ball; the upper part of the little muscle obviates this tendency. As such appears to be the actions of the part, I must, therefore, coincide with him in calling it the Tensor Tarsi, a name expressive of its functions.

The puncta lachrymalia have a power, noticed by Richter, of projecting themselves beyond the plane of the eyelid in which they lie, and have an equally obvious power of retracting themselves, so as to do away all appearance of prominence. I do not understand the cause of the first motion, but the second depends upon the muscle just described.

[This discovery of the Tensor Tarsi Muscle, as above described, was made by Dr. Horner, about 1822, and published in the *Philadelphia Journal of the Medical and Physical Sciences*, in 1824. His "claim to its discovery has been unequivocally admitted by Messrs. Breschet and Jourdan, of Paris, anatomists of distinction, in their translation of *Meckel's Anatomy*, vol. iii. p. 219, as well as by Guy, in the *Melanges de Chirurgie Etrangere*, Geneva, 1824, p. 415; and by Professor Trasmondi, in the *Arcadica Journal of Rome*, vol. xix. p. 1, 1823. It has also been admitted into the myology of the most classical works on anatomy, the highest of which may be considered the latest edition of *Sœmmering de Corp. Herm Fabr*, under the title of *Encyclopèdie Anatomique*, Paris, 1843."* Up to the latest moment of his life, Dr. Horner, whose accuracy and honor was proverbial among those who knew

* Horner, Special Anatomy and Histology, 8th edition, vol. ii. p. 396.

him, never saw any satisfactory proof that this muscle had ever been previously noticed, though numerous claims were soon advanced to it by European anatomists. After a period of more than thirty years these claims have been again made by European writers, one of whom, thinking it to be Duverney's muscle, boldly asserts that it was known before Dr. Horner was born,* though nearly all contemporaneous anatomists were ignorant of it, or described a portion of the orbicularis as the Tensor Tarsi. It will therefore require stronger proof than such loose statements, before the American student will yield credence to a claim which is intended to destroy a title that has been generally admitted as correct since 1824. Those more specially interested will find full information on this subject in the paper of Dr. Horner, which was published in support of his discovery, in the *Philada. Journal Med. Sciences*, vol. ix.—Ed.]

The Ball of the Eye (Bulbus Oculi) is composed of several coats and humors. As the human subject can seldom be obtained sufficiently fresh for a proper display of the structure, it is recommended to use the eyes of sheep, bullocks, or pigs, which can be got at any time. The eye is to be removed from the orbit, and cleared of its fat and muscles. Anatomists have devised various means for fixing it for dissection; but for my own part, I have found a common saucer, with water enough in it to float the organ, sufficient. The specific gravity of this fluid approaches so nearly to that of the eye, that it affords a very good support to its delicate membranes, and sufficient stability for most purposes of examination.

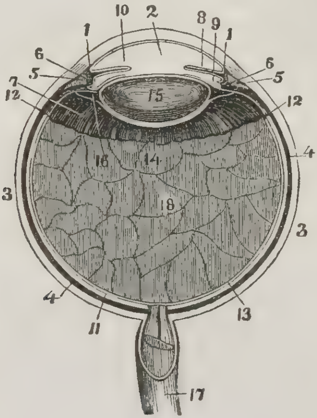
[A new muscle of the eye has recently been discovered by Dr. N. R. Moseley, of Philadelphia, which he supposes is an antagonist to the Tensor Tarsi Muscle. As described by Dr. Moseley,† it is a small muscle, placed upon the outer side of the globe of the eye, parallel for a short distance with the external rectus.

It arises from the orbital surface of the malar bone, anterior to its union with the orbital surface of the sphe-

* Operative Ophthalmic Surgery, by Walton, American edition, p. 132.
† Boston Medical and Surgical Journal, August 3, 1853.

noid bone, and running forwards, its tendon is inserted with the fibrous structure of the outer angle of the eyelid. By making the muscle tense, the external canthus is drawn outwards and backwards.—Ed.]

Fig. 72.



A Horizontal Section of the Eye.

1, 1. The Cornea, fitted into the Sclerotica.
2. Its Posterior Lamina, or Cornea Elastica, forming the Anterior Parietes of the Chamber for the Aqueous Humor.
3, 3. Sclerotic Coat.
4, 4. Choroid Coat.
5, 5. Ciliary Ring or Ligament.
6. Its Internal Surface, corresponding to the Ciliary Processes.
7. Ciliary Body, or Corona Ciliaris of the Choroid Coat.
8. The Iris.
9. Posterior Chamber of the Aqueous Humor.
10. Anterior Chamber of the Aqueous Humor.
11. The Retina.
12, 12. Termination of the Retina (according to Cruveilhier and others, *margo dentatus*), at the Posterior Extremities of the Ciliary Processes of the Vitreous Body.
12. The Vitreous Humor.
13. The Hyaloid Tunic, one Layer of which passes behind.
14. The other in front of the Crystalline Lens.
15. The Lens.
16. Canal of Petit.
17. Optic Nerve, invested by a Sheath from the Dura Mater.
18. Vitreous Humor, or Corpus Vitreum.

The TUNICA SCLEROTICA, the first coat of the eye, is to be examined by opening the ball very freely, and turning out all of its contents. We shall then see that it has considerable thickness, being of a compact fibrous texture, possessed of little elasticity, and therefore well calculated for giving support to the interior structure. It is white and tendinous like the dura mater, and has few vessels or nerves. It is connected behind to the optic nerve, where it is perforated by several small holes for the passage of the nerve; and before to the Cornea.

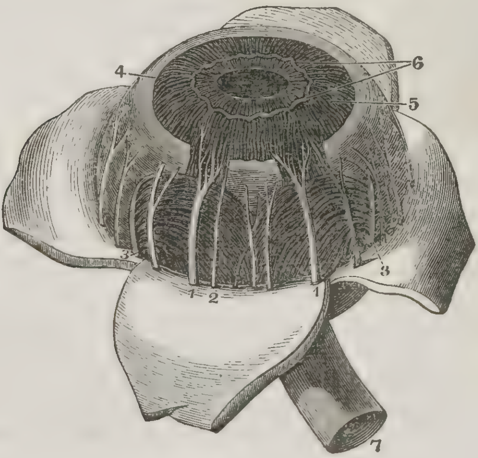
The CORNEA is a perfectly transparent membrane, consisting of many laminæ, united by a delicate cellular substance. It is much more convex than the sclerotica, and is united to it by a broad sloping edge, where the two membranes adhere very firmly to each other by the sclerotica overlapping the cornea. They may be separated by putrefaction. The cornea, in a healthy state, has no red blood circulating through it. It is covered before by the tunica conjunctiva, which there becomes assimilated in its sensible properties to it, and behind by the capsule of the aqueous humor.

An eye being floated in the manner just mentioned, a puncture is to be made with a lancet or sharp-pointed scalpel, through the sclerotica, about half-way from its centre; and the blunted blade of a pair of scissors being introduced through the opening, a circular cut should be made all around, taking great care not to injure the coat below. By making radiated sections to the optic nerve from this circular one, we shall be able to peel off, with but little difficulty, all the posterior part of the sclerotica, observing, however, to leave the optic nerve. What remains of the anterior part of the sclerotica, may be easily drawn away along with the cornea. This stage of the dissection gives a good view of the Tunica Choroidea; of a white circle called the Ciliary Ligament, seeming to terminate it before, and of the Iris placed upon the forepart of the eye, an opening in the middle of which affords a glimpse of the internal structure.

The TUNICA CHOROIDEA lines all the interior of the sclerotica, and is a much thinner and more delicate membrane than it; it appears black, and is covered on the outside with a flocculent cellular substance connecting it with the sclerotica. Its black color depends upon a large quantity of coloring-matter deposited principally on its inner surface, and called Pigmentum Nigrum. The tunica choroidea abounds with bloodvessels, which make it look perfectly red in living animals devoid of the black pigment. It has a singular arrangement of veins, which

Fig. 73.

DISSECTION OF THE EYE, IN WHICH THE SCLEROTICA HAS BEEN DISSECTED OFF AND TURNED DOWN, IN ORDER TO EXPOSE THE NERVES AND SOME OF THE BLOODVESSELS.

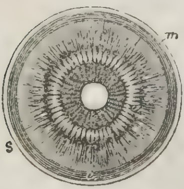


1, 1. Ciliary Nerves entering the Ciliary Ligament and passing forward to the Iris: the Ligament is dissected away in two places to show their course.
2. Smaller Ciliary Nerve.
3. Vasa Vorticosa, or Veins of the Exterior Layer of the Choroid.
4. Ciliary Ligament and Muscle.
5. Converging Fibres of the Greater Circle of the Iris.
6. Looped and knotted form of these Fibres near the Pupil; the knots or enlargements being regarded as Ganglia by Meckel. Within them is seen the *lesser circle*, Sphincter Iridis, with its Converging Fibres.
7. The Optic Nerve.

can be made distinct only by injection. They are called Vasa-Vorticosa. It is well furnished with nerves, which appear like flattened pieces of white thread lying on its outside. If the Iris be torn away, the anterior edge of the membrane is seen terminating in a fringe, called Corpus Ciliare, and this fringe, if closely observed, will be seen to consist of a great number of short and distinct processes, arising from small folds, called the Ciliary Striæ, and covered with pigmentum nigrum.

Fig. 74.

INTERNAL VIEW OF THE CHOROID COAT AND CILIARY PROCESSES, AS SEEN IN A VERTICAL SECTION OF THE EYEBALL.



a, b. Corona Ciliaris, or Ciliary Body, the rays of which are adherent to the Choroid at *b*, and free at *a*.
s. Sclerotic Coat.
c. Choroid Coat.

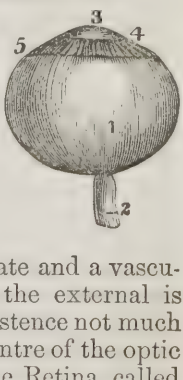
The IRIS is a membrane placed across the eye just behind the cornea; it is highly vascular, but having a large quantity of pigmentum nigrum on its posterior surface, the vessels are not evident in a living state. Its anterior surface determines the color of the eye. In its centre is a round hole called the Pupil, for admitting light, and which is increased or diminished, by the action of circular and radiated filaments composing the body of the membrane. They are considered by many as muscular. In the Fœtus, the pupil is closed till the seventh month by the Membrana Pupillaris.

The CILIARY LIGAMENT, as stated, is a circle of whitish substance which is placed around the anterior part of the eye, and serves to connect strongly the Iris with the Tunica Choroidea, and these again with the anterior edge of the Sclerotica and the margin of the cornea. In it is a canal, called the Aqueduct of Fontana.

Having finished the examination of these parts, strip off the whole of the Tunica Choroidea with two pair of fine forceps. This is one of the nicest manipulations in the whole dissection, and must therefore be done with great care. If it be well executed, the most delicate membrane in the human frame will be found lining the choroid coat; it was discovered in Dublin, by Mr. Jacobs, and may be satisfactorily demonstrated, by commencing at the optic nerve with the extremity of a knife-handle, and turning the membrane down, by scraping towards the anterior part of the eye. It extends from the optic nerve to the anterior edge of the retina.

Beneath the Tunica Jacobi, is placed the RETINA, a delicate, transparent, and pulpy membrane, extending from the optic nerve, distinctly to the commencement of the Ciliary Striæ of the Choroid Coat; and some anatomists maintain that it goes on as far as the circumference of the Crystalline Humor, which is by no means so obvious. The optic nerve, after penetrating the cribriform part of the Tunica Sclerotica, forms a bulb on its inside; from this bulb the membrane called Retina is expanded over the interior surface of the eye. The Retina consists

Fig. 75.
THE RETINA, AFTER THE REMOVAL OF THE CHOROID COAT.

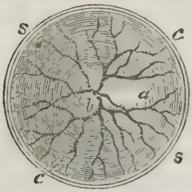


1. The Retina.
2. The Optic Nerve.
3. The Iris.
4. The Vitreous Body.
5. Termination of the Retina at the Posterior Extremities of the Ciliary Processes of the Vitreous Body.

of two layers; the internal is a very delicate and a vascular network, consisting of fine meshes; the external is the proper nervous matter, having a consistence not much stronger than common mucus. In the centre of the optic nerve is seen the artery which supplies the Retina, called the Arteria Centralis. The branches of veins correspond with the arterial ramifications, and we commonly see them distended with blood, in our dissections of animals killed by a blow on the head. In the centre of the Retina is the Foramen of Sœmmering, surrounded by a yellow spot, and having a fold connecting it to the bulb of the optic nerve. Impressions made on the Retina are sup-

Fig. 76.

YELLOW SPOT AND CENTRAL ARTERY OF THE RETINA. (From Sœmmering.)



a. Yellow Spot.
b. Point of Entrance of the Optic Nerve.
c. Choroid Coat.
s. Sclerotic Coat.

posed, generally, to be the cause of vision, and of the contractions and dilatations of the pupil. The late Dr. Physick believed, in regard to the latter, that the Iris was immediately stimulated by the light, as he had seen cases where its motions were active and well marked, in paralysis of the Retina.

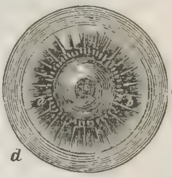
The HUMORS OF THE EYE are three, the Vitreous, Crystalline, and Aqueous. They are all perfectly transparent, but differ much in their consistence and structure.

The VITREOUS occupies nearly all the eye posterior to the Iris; it is like melted glass, from whence its name. When minutely examined, it is found to consist of a fluid like water, contained in a very delicate membrane or capsule, which is cellular; the peculiar consistence of it is therefore derived from the latter. This capsule, called Tunica Hyaloidea, is fixed at the bottom of the eye by a branch of the central artery of the Retina, and before, by a close adhesion to the Ciliary Striæ and Body. The Retina lies loose upon it.

The CRYSTALLINE HUMOR is fixed on the anterior part of the Vitreous just behind the pupil. It is a dou-

Fig. 77.

ANTERIOR VIEW OF THE EYEBALL AFTER THE REMOVAL OF THE CHOROID COAT AND IRIS, SHOWING THE CILIARY PROCESSES OF THE VITREOUS BODY, OR ZONULA ZINNII.

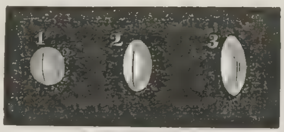


a, *b*. Zone of Zinn.
c, *c*. Retina.
d. Junction of the Retina with the outer margin of the Processes.

ble convex lens, about three and a half or four lines in diameter, the posterior convexity of which is much the greatest. Its consistence is that of half-dissolved glue,

Fig. 78.

CRYSTALLINE LENS.



1. Lens at Birth.
2. At Six Years of Age.
3. Form of the Lens in Adult Life.

but it becomes more solid toward the centre. By putting it in boiling water for half an hour, it becomes hard and opaque, and one is enabled to unravel its structure. It consists entirely of concentric lamellæ, which may be separated with a needle into very fine fibres. It is inclosed in a capsule of the same shape, and between it and the capsule is found a small quantity of transparent fluid called Liquor Morgagni. Anatomists do not agree in regard to the origin of the capsule, some thinking that it is entirely derived from the tunica hyaloidea, others that it is totally distinct from it, an opinion which I am disposed to consider the correct one. Admitting the opposite to be correct, the structure of the tunica hyaloidea is unquestionably much altered, especially in front, as the capsule there is possessed of more thickness, is elastic, and cuts very much like the thin shavings of a fingernail. In the tunica hyaloidea, surrounding the circumference of the capsule of the lens, is placed the CANAL OF PETIT, which, when inflated or injected, is seen to be divided in a radiated manner, by a number of incomplete partitions.

The AQUEOUS HUMOR is placed between the lens and the cornea, and is nearly as thin as water. The Iris floating in it has occasioned the division of the space occupied by the aqueous humor into Anterior and Posterior Chambers of the Eye; all the space of the aqueous humor behind the Iris is called the Posterior Chamber, and all the space before the Iris is called the Anterior Chamber. Both of these chambers are said by Mr. J. Cloquet to be lined by the capsule of the aqueous humor; this membrane, however, is not very evident except on the posterior surface of the Cornea.

The ball of the eye, and the muscles surrounding it, are imbedded in a considerable quantity of adipose matter, the profusion of which, in health, gives prominence to the organ, and the absorption of which produces the sunken eye of disease.

§ 1. OF THE VESSELS AND NERVES MET WITH IN THE ORBIT.

To display these parts, the roof of the orbit must be entirely removed. The internal Carotid Artery, as it lies near the anterior clinoid process of the sphenoid bone, detaches a large branch, the Ophthalmic, which, in passing the optic foramen, is first under the optic nerve, then gets to the outside of it, and finally winds over to the inside of the nerve. Near the posterior part of the eye, it sends off a branch which penetrates to the centre of the optic nerve, and is distributed to the retina. It also divides into several branches which go to the Lachrymal gland; to the muscles of the eyeball; to the Tunica Choroidea, constituting the Ciliary Arteries; and finally branches which pass through the anterior and posterior æthmoidal foramina and through the superciliary foramen. At the bottom of the orbit, and coming out at the infra-orbitar foramen upon the face, is found a large branch of the Internal Maxillary Artery.

The Veins of the Orbit have very much the same course with the arteries, some being connected with the facial vein at the internal angle of the eye, and passing into the external jugular; others sending a trunk through the foramen opticum, which runs into the cavernous sinus, and consequently into the lateral sinuses.

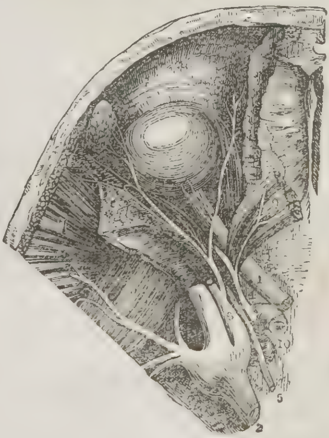
Five trunks of Nerves are to be found in the Orbit.

1. The Optic, which is expanded into the Retina.

2. The Third Pair, or Motor Oculi, which, passing through the foramen sphenoidale into the orbit, divides into two branches. One of these goes to the upper part of the orbit, and is distributed to the Levator Oculi, and the Levator Palpebræ Superioris; the other passes to the

Fig. 79.

Deep Nerves of the Orbit, brought into View by removing the Roof of that Cavity, and dividing the Levator Palpebræ Superioris and Rectus Superior Muscles.



1. Optic Nerve.
2. Trigeminus.
3. Ophthalmic Nerve.
4. Motor Oculi.
5. Motor Externus.
7. Temporal Muscle.
8. Cut Surface of the Bone.
9. Rectus Superior and Levator Palpebræ Muscles divided.
10. Carotid Artery.

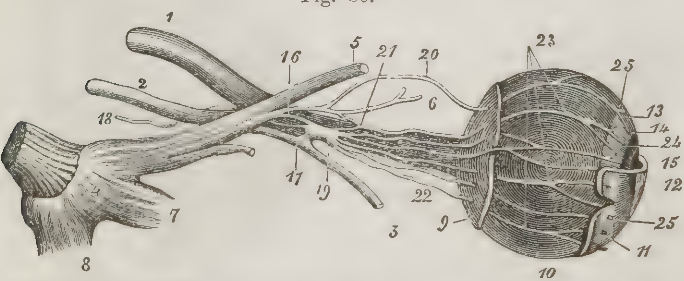
Adductor, the Depressor, and the Obliquus Inferior. From it is sent a filament which runs to the Lenticular or Ophthalmic ganglion; the latter is situated on the outside of the optic nerve, near its entrance into the orbit.

3. The TROCHLEARIS or Patheticus, the Fourth pair of nerves, is exclusively appropriated to the Obliquus Superior muscle, and also gets into the orbit, through the foramen sphenoidale.

4. The MOTOR EXTERNUS, or Sixth pair of nerves, passes through the foramen sphenoidale of the orbit, and is spent on the Musculus Abductor.

5. The First Branch of the Fifth nerve, or the OPHTHALMIC, passing also through the same foramen, divides into the Frontal, Nasal, and Lachrymal. The first has but little to do with the orbit, as it simply passes along its superior part, to get out upon the forehead through the supra-orbitar foramen, and at the trochlea of the os frontis. The second passes along the inner side of the orbit, sends a filament to the lenticular ganglion, another through the anterior æthmoidal foramen, which goes ultimately to the nose, and what remains is distributed to the lachrymal sac and the contiguous parts. The third branch goes to the lachrymal gland, whence its name.

Fig. 80.



EYE OF THE RIGHT SIDE, SHOWING THE OPHTHALMIC, LENTICULAR, OR CILIARY GANGLION, ITS ROOTS AND BRANCHES, TOGETHER WITH THE GANGLION OF GASSER.

1. Optic Nerve.
2. Trunk of the Motor Oculi.
3. Inferior Branch of the latter Nerve.
4. Ganglion of Gasser.
5. Its Ophthalmic Branch.
6. Nasal Branch of the Ophthalmic, cut off.
7. Superior Maxillary Branch of the Trigeminus.
8. Inferior Maxillary Branch of the same Nerve.

9. Posterior portion of the Sclerotic Coat, perforated by the Ciliary Nerves.
10. Choroid Coat.
11. Anterior portion of the Sclerotic Coat, traversed from within outwards by the Ciliary Nerves.
12. Inferior Segment of the Cornea.
13. Ciliary Ligament.
14. Iris.
15. Pupil.
16. Sensitive Root of the Ophthalmic Ganglion, derived from the Nasal Branch of the Opthalmic Nerve.
17. Its Short or Motor Branch.
18. Sympathetic Filament.
19. Ophthalmic Ganglion.
20. The strait or direct Ciliary Nerve, derived from the Nasal Branch.
21. Anastomosis between the Nasal Branch and short Ciliary Nerve.
22. Ciliary Nerves from the Ophthalmic Ganglion.
23. The same Nerves a little flattened, and anastomosing with each other on the surface of the Choroid Coat.
24. Motor Ramuscles of the same nerves, extended to and distributed upon the Iris.
25. Ciliary Filaments that perforate the Sclerotic Coat to be distributed upon the Conjunctiva.

SECTION IV.

OF THE EAR.

The organ of hearing may, for the purpose of study, be divided into three parts, the boundaries of which, even by nature, are well defined; to wit, the External Ear, the Tympanum, and the Labyrinth.

§ 1. OF THE EXTERNAL EAR.

The EXTERNAL EAR consists of the structure exterior to the head; and of the passage called the Meatus Auditorius Externus, leading to the interior of the petrous portion of the temporal bone.

The part in common language called Ear is principally cartilaginous; but to the lower edge of the cartilage is appended a softer structure, consisting of delicate granulated adeps, with a kind of tendinous cellular membrane. The cartilaginous portion is called Pinna, the other Lobus. The pinna presents a very unequal surface, both on the outside and on the inside. The former, being the part employed in collecting rays of sound, and converging them through the meatus externus, merits our principal attention. The deep concavity in the middle of it is called Concha. In the upper part of the concha, and dividing it into two unequal fossæ, we find a ridge of cartilage commencing, which is traced in the form of a scroll, along the circumference of the pinna, till it terminates insensibly in the posterior part of the lobus. This fold is the Helix; within it is a ridge of cartilage, which is the Antihelix, terminating above by a bifurcation. On the anterior part of the concha, and overlapping it obliquely, is the cartilaginous process called Tragus, and opposite to it, at the lower end of the antihelix, is the Anti-Tragus. Under the fold of the helix is the Cavitas Innominata, and between the bifurcation of the antihelix is the Scapha.

The Meatus Auditorius Externus, is in the adult about one inch in depth, calculating from the bottom of the concha to the membrane of the tympanum; it proceeds obliquely forwards, in a course corresponding to the situation of the petrous bone, and besides that, has a curve with the convexity upwards, so that when we wish to see the membrana tympani, or look to the bottom of the canal, the external ear must be pulled upwards and backwards. The internal half is bony, but the outer half is composed of cartilage and of ligamentous matter. If the skin be removed from the ear, it will be seen that the concha is formed not entirely by cartilage; but at the bottom of it, and connecting it and the commencement of the helix with the tragus, is a ligamentous expansion, which contributes also to the meatus externus. In the tragus cartilage, near the bone, are found two fissures filled up with elastic ligamentous substance; they are the Incisuræ. The whole of this arrangement of cartilaginous and membranous matter is highly favorable to the exercise of the sense, as the former, by its resistance, is well calculated for reverberating sound, and the latter affords great facility of motion, as a kind of hinge is formed by the incisuræ. The cartilaginous matter is joined by ligaments to the bony meatus, the exterior edge of the petrous bone being rough and irregular for this purpose; there are also three ligaments, one sent to a point above the mastoid process, one to the zygomatic process, and a third to the temporal aponeurosis.

The External Ear is covered by a delicate skin, having a great number of sebaceous follicles in it; as the skin descends into the meatus, it becomes still more delicate and sensible, is beset with hairs, and under it are found, in considerable numbers, the Glandulæ Ceruminosæ, which secrete the wax.

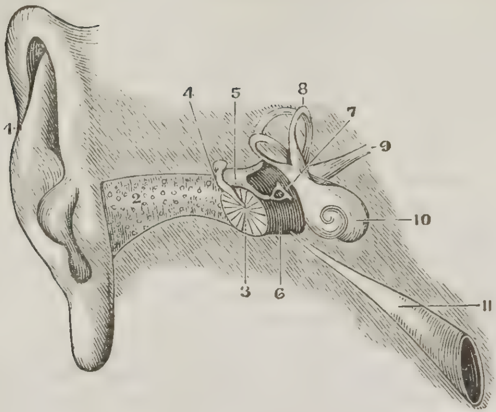
On the external ear are five muscles, which can seldom be seen distinctly enough to merit the name. On the superior and anterior part of the helix, is the Helicis Major; on its inferior part is the Helicis Minor; on the anterior side of the tragus is the Tragicus; on the anterior part of the antitragus is the Antitragicus; and on the cranial side of the ear is the Transversus Auris.

In most persons, there are also three muscles appropriated to the movement of the external ear upon the head, and which, though sufficiently well developed, are scarcely ever employed. The Attolens Auriculæ, which arises by a broad membrane from the tendon of the occipito-frontalis and the fascia of the temporal muscle, and is inserted into the prominence made by the Scapha, or Fossa Navicularis. The Anterior Auriculæ, which arises from the temporal fascia, just above the posterior part of the zygoma, and is inserted into the anterior part of the helix. And the Retrahens Auriculæ, consisting of two or three parallel slips, the inferior of which arises from near the root of the mastoid process, and is inserted into the prominence made by the concha below; while the second slip arises from the temporal bone higher up than the former, to be inserted also into the back of the concha above the first. The names of these muscles express their action.

§ 2. OF THE TYMPANUM.

This is the middle portion of the organ of hearing, and is situated in the outer part of the Petrous Bone, being separated from the Meatus Externus by a partition called Membrana Tympani. The membrana tympani is placed very obliquely just at the bottom of the meatus, its upper part being the outermost. It is not flat, but has its centre drawn inwards by the handle of the malleus.

Fig. 81.



THE INTERNAL AND EXTERNAL EAR.

1. Ear.
2. Meatus Auditorius Externus, with its Ceruminous Glands.
3. Membrana Tympani.
4. Malleus.
5. Incus.
6. Cavity of the Tympanum.
7. Stapes.
8. Semicircular Canals.
9. Auditory Nerve entering the Cochlea.
10. Cochlea.
11. Eustachian Tube.

It consists of four layers, the cuticle, the true skin, the proper membrane, and the lining membrane of the tympanum. When successfully injected, it shows a high degree of vascularity. The two outer layers are easily separated from the others, and do not partake much of their vascularity.

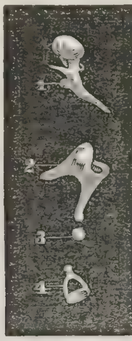
The tympanum contains a great deal of curious and interesting structure; its depth is about three lines; its antero-posterior diameter six lines; and its vertical diameter rather more. On its superior posterior part is an oval opening, communicating with an extensive cellular arrangement in the Mastoid Portion of the temporal bone; and on its anterior side is seen the canal of Eustachius, going to the posterior naris. In the bottom and central part of the tympanum, is a striking convexity, the Promontory, just above the superior edge of which is the

Foramen Ovale, and below and somewhat behind it, is the Foramen Rotundum. On the posterior surface of the tympanum, in a line with the foramen ovale, is a very small bony process, the Pyramid, which is hollow, and has a hole in its apex.

Four small bones are found in the tympanum, which form a chain between the membrana tympani and the Labyrinth; they are the Malleus, Incus, Os Orbiculare, and Stapes.

Fig. 82.

OSSICLES OF THE EAR, OF THE NATURAL SIZE.



1. Malleus.
2. Incus.
3. Orbicularis.
4. Stapes.

The MALLEUS is placed before the others, and consists of a spherical head, a neck just below the head, uniting it with a tapering handle; a long and crooked projection of the anterior part of the neck, called Processus Gracilis, and a short one on the outside below the other, called Processus Brevis, which sends out a round ligament to the edge of the tympanum.

This ligament is described by some as the Laxator Tympani Minor Muscle.

The INCUS is behind the malleus, and resembles somewhat a molar tooth, with two fangs widely separated, one being much longer than the other. The superior and anterior part of the body of the bone is excavated for articulating with the head of the Malleus. From the lower part of the body proceeds the Processus Longus; and from the back part, looking into the orifice of the mastoid cells, is the Processus Brevis.

The Os Orbiculare is a flattened sphere, about the size of a mustard-seed, placed between the extremity of the long process of the Incus and the Stapes.

The Stapes resembles very much a stirrup-iron, and is placed horizontally at right angles with the malleus. It has a small head, articulating with the os orbiculare, from which proceed an anterior and a posterior crus. On the inner side of each crus is a fossa, running its whole length. The crura, diverging in their progress and gently bent, are united by a broad base, which corresponds in its dimensions with the foramen ovale, over which it is placed.

To get a good view of the malleus and incus, we must cut away the superior margin of the tympanum; their bodies will then be seen placed vertically and in contact, a complete articulation being formed by them.

The cavity of the tympanum is lined by a delicate and vascular membrane, continued through the Eustachian Tube from the pharynx, and into the Mastoid Cells. The little bones are all covered by a reflection of the same, and the foramen rotundum is closed up by it.

There are three muscles appropriated to the movement of these bones, two to the Malleus, and the other to the Stapes.

The Laxator Tympani Muscle is placed in the glenoid fissure of the temporal, and, arising from the spinous process of the sphenoid bone, is inserted into the processus gracilis of the Malleus. It draws the Malleus forward and outwards, so as to relax the membrane of the tympanum.

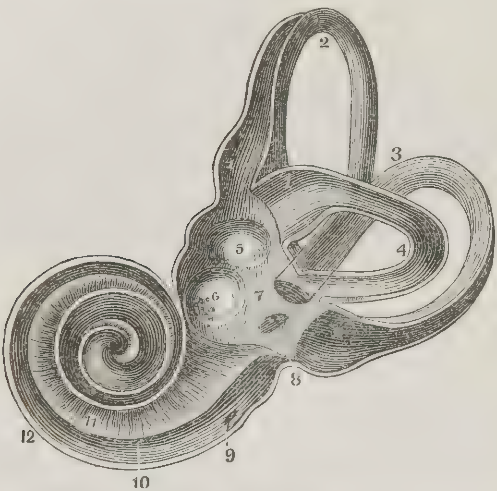
The Tensor Tympani arises from the cartilage of the Eustachian tube, lies in its upper bony part, and is inserted by a tendon into the neck of the malleus, a little below the processus gracilis. It draws the handle of the malleus inwards, and makes tense the membrana tympani.

The STAPEDIUS arises from the bottom of the cavity of the pyramidal process, and is inserted by a delicate round tendon into the head of the Stapes. It draws this bone backwards.

§ 3. OF THE LABYRINTH.

To obtain a good view of this structure, a fœtal bone must be procured, as the labyrinth is more accessible in it, and nearly as fully developed as in the adult. The petrous bone here has a condensed but thin structure on

Fig. 83.



THE OSSEOUS LABYRINTH, LARGELY MAGNIFIED AND DIVIDED LONGITUDINALLY.

7. The Vestibule.
8. Aqueduct of the Vestibule.
5. Fossa Semielliptica.
6. Fossa Hemispherica.
2, 3, 4. Semicircular Canals.
2 Superior Semicircular Canal.
3. Posterior Canal.
4. Inferior Canal.
1, 1, 1. Ampullated Extremity of each Canal.
12. Cochlea.
9. Aqueduct of the Cochlea.
11. Osseous Zone of the Lamina Spiralis, above which is the Scala Vestibuli communicating with the Vestibule.
10. Scala Tympani, below the Lamina Spiralis.

its surface, which being removed, brings into view a soft cellular bone, easily managed with a penknife. By paring it away, we come in contact with the labyrinth, which is readily recognized by its hardness and brittleness, and may be got out with but little trouble. Having proceeded thus far, the labyrinth is seen to consist of three parts; above and posteriorly are the Semicircular Canals, in the centre is the Vestibule, and below is the Cochlea. The whole of this structure is hollow.

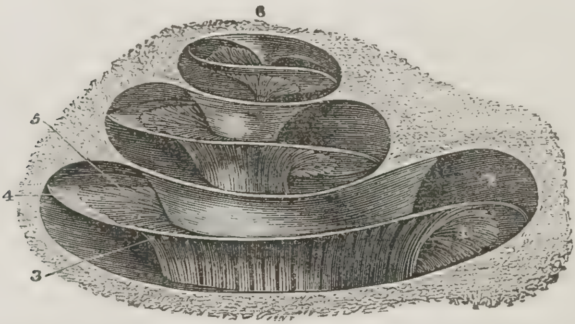
The SEMICIRCULAR CANALS, attached to the back and upper part of the vestibule, are so situated that one is Superior, another Posterior, and the third Exterior. The superior and posterior are united together at their upper extremities, and therefore have a common canal entering into the vestibule; their other extremities are widely divergent from each other, and enlarged, each forming an ampulla before it enters into the vestibule. The exterior canal is shorter than the others, lies nearly horizontal, and has its external extremity enlarged also into an ampulla, which is placed near the ampulla of the superior canal. These three canals, from two of them uniting, have only five orifices in the vestibule.

The VESTIBULE has a cavity about the size of a grain of barley, and is placed just on the inner part of the bottom of the tympanum. The foramen ovale is the common orifice between them. On the superior and exterior part of the cavity, contiguous to the openings of the canals, is the semielliptical depression, and below this and somewhat more internally, is the hemispherical depression, the recollection of both of which will be useful to us at a subsequent period of the description. At the lower part of the vestibule is a foramen communicating with the cavity of the cochlea.

The COCHLEA consists of a conical tube wound spirally two and a half times on itself, and is fixed at the anterior part of the vestibule. It has a broad cribriform base, forming the bottom of the meatus auditorius internus, and an apex which occasions the promontory in the tympanum. Passing from its base towards the apex is a pillar of bone, called Modiolus, on which the conical tube is wound. This pillar tapers almost to a point, and then is spread out into a cavity resembling a funnel, from whence the name Infundibulum. The apex of the cochlea, from its covering over the Infundibulum, is called the Cupola.

Fig. 84.

Magnified View of the Cochlea of a New-born Infant, opened on the Side towards the Apex of the Petrous Portion of the Temporal Bone.



1. Scala Tympani.
2. Scala Vestibuli.
3. Lamina Spiralis.
4. Zona Valsalvæ vel Membranacea.
5. Zona Ossea.
6. Cupola.

When the conical tube is cut open freely, a partition is seen to divide it into two equal portions from the base to the summit. This partition, called Lamina Spiralis, arises by two delicate lamellæ of bone with an intermediate cellular structure, from the Modiolus, but does not go completely across the canal, for, on minute examination, the lamina spiralis is seen to consist, besides cartilage, of a cellular portion containing a fluid, and of a membrane. These portions are called Zones; we therefore have Zona Ossea, Coriacea, Vesicularis, and Membranacea. The lamina spiralis terminates in the infundibulum by a process called Hamulus.

The divisions in the Cochlea, thus made by the lamina spiralis, form the scalæ. The lowest of these scalæ has the foramen rotundum from the tympanum, looking into its base, and the upper communicates by the foramen at the bottom of the vestibule, with the cavity of the vestibule. From these communications we have the names Scala Tympani and Scala Vestibuli. The scalæ communicate also with each other just at the hamulus in the infundibulum.

The whole labyrinth is lined by a highly vascular membrane, exhibited by our preparations in the University, which seems to be very different from common periosteum.

Thus far, the description has applied only to the bony labyrinth, but, by removing it, we shall find, besides the vascular membrane just mentioned, the following parts. Three Membranous Semicircular Canals within the bony, conforming to their figure, and containing a pellucid fluid; these canals all communicate by their extremities with a sac, called Sacculus Ellipticus, and by Scarpa, from its function, Alveus Communis, situated in the semielliptical depression of the vestibule. In it are found some small, crystalline, pulverulent masses of a calcareous composition, which are thought to contribute to the auditive function of the Labyrinth, and are called Otoconie by Mr. Breschet. Within the vestibule, and occupying the hemispherical cavity, is another and smaller sac like a bubble, filled with a transparent fluid, distinct from the former, and called the Sacculus Sphericus. To complete this part of the description of the labyrinth, it is to be observed that between the bony and membranous canals, in the vestibulum on the outside of the sacs, and in the scalæ of the cochlea, is to be found a transparent fluid, which can pass from one of these cavities into the other by the foramina already mentioned.

It is in connection with this fluid that we find the two supposed aqueducts for its removal, called after Cotunnius, one for the Vestibule, another for the Cochlea. The first arises near the common orifice of the superior and posterior semicircular canals, and discharges itself just behind the meatus auditorius internus. The other comes from the cochlea near the foramen rotundum, and runs into the jugular fossa just at the root of the spine for separating the eighth pair of nerves from the internal jugular vein. In investigating these canals, Mr. Ribes has since ascertained that they only conduct bloodvessels, and that Cotunnius and others were in error in regard to their functions.

The Nerve of Hearing, or the PORTIO MOLLIS, is distributed throughout the labyrinth. The bottom of the meatus internus being divided into two unequal fossæ by a ridge, the uppermost is the smaller, and perforated with several foramina, all of which, except the anterior large one, are appropriated to the passage of the portio mollis to the vestibule. The larger fossa at the bottom of the meatus is also cribriform, and forms the basis of the cochlea; through it pass the fibrillæ to the cochlea, vestibule, and semicircular canals. The portio mollis, descending to the bottom of the meatus, passes in several divisions to the soft structure within the bony labyrinth. One division entering the vestibule is spent on the alveus communis and membranous canals; another division goes to the sacculus sphericus. A third division, penetrating from the base of the modiolus, runs through it, and comes out upon the lining membrane of the cochlea, between the plates of the lamina spiralis, and through the infundibulum and other parts. The fibrillæ of the portio mollis, during this distribution, continue exceedingly delicate, and are finally found in a pulpy state resembling the retina, upon the internal surface of the cavities and sacs just mentioned.

The PORTIO DURA, though not concerned in the function of hearing, passes though the petrous bone in a curious manner. Entering into the large foramen in the upper fossa of the meatus internus, it goes outwards almost as far as the vidian foramen, and there makes a very abrupt turn backwards, forming an acute angle called its elbow. It then runs just above the foramen ovale, making a ridge in the tympanum; continues its course so as to surround the back part of the tympanum, and emerges at the foramen stylo-mastoideum. It is afterwards distributed to the face. Its canal in the bone is called the Aqueduct of Fallopius. Near the Vidian foramen, it sends a filament to the tensor tympani, and at the base of the pyramid, one to the stapedius.

The Chorda Tympani, a branch of the pterygoid nerve, passes into the Vidian foramen and joins the portio dura, running closely connected with it almost to the stylo-mastoid foramen. It then leaves the portio dura at an acute angle, enters into the back part of the tympanum, and crosses this cavity completely, by going between the long leg of the incus and the handle of the malleus. It gets from the tympanum through the glenoid foramen, and joins ultimately the lingual branch of the fifth pair of nerves.

The labyrinth is principally supplied with blood from a branch of the vertebral artery, which gets to it through the meatus internus. The tympanum and external ear are supplied from the stylo-mastoid and temporal arteries.

SECTION V.

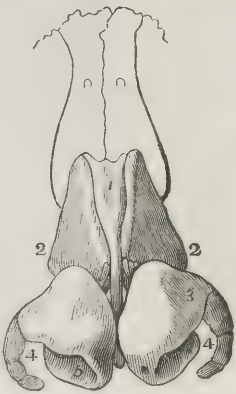
OF THE NOSE.

In order to understand this part of our structure, it is necessary to be well acquainted with the bones constituting its cavity, both individually and collectively. Being thus prepared, we shall see that the nostrils, which are incompletely separated from each other in the skeleton, have a perfect septum in the recent subject, which renders them two distinct cavities. This is effected by a cartilage placed at the anterior part of the vomer and of the nasal lamellæ of the ethmoid bone. At the junction of this cartilage with the nasal structure, it spreads out at each side into a wing, which is attached to the lower edge of the nasal bones and the adjoining margin of the nasal process of the upper maxillary, and extends, by such means, the bridge of the nose.

Proceeding from the lower edge of the wing of this cartilage, and from the external bony margin of the anterior naris, is an elastic ligamentous membrane forming the side of the nostril. At the anterior part of this membrane is an oval cartilage, which forms two-thirds of a ring; the exterior portion of it is the broadest; the internal portion, placed in contact with the corresponding part of the oval cartilage of the other side, runs backwards, and forms by the union the Columna Nasi. In the back of the ligamentous membrane there are several detached pieces of cartilage, which give firmness to the structure, and produce the prominence of the ala nasi. It is by means of these several cartilages that the orifice of the nostril is kept open.

Fig. 85.

THE NASAL CARTILAGES, SHOWING THEIR CONNECTION WITH EACH OTHER AND WITH THE OSSI NASI.



1. Cartilage of the Septum.
2, 2. Lateral Cartilages.
3. Ala Cartilage.
4. Cornua, or Appendices of the Ala Cartilage.
5. Nostril.

The posterior nares being separated by the vomer, are oval, and do not present an outline differing much from that produced by the naked bone. At the posterior extremities of the inferior turbinated bones are the orifices of the Eustachian Tubes, placed obliquely, and large enough to admit the end of the little finger. It is not difficult to reach them with an instrument gently curved, introduced through the inferior meatus of the nose, an operation frequently required in cases of deafness. They are here partly membranous and partly cartilaginous, running upwards and outwards, to the bony canal leading to the cavity of the tympanum.

The SCHNEIDERIAN MEMBRANE is spread over all the bones composing the nostril, and by its thickness diminishes the foramen leading into the sinuses. Under the anterior part of the middle spongy bone, is an orifice which leads through the ethmoidal cells into the frontal sinus. At the middle part of the middle meatus, or that between the lower and middle spongy bones, is the opening into the Antrum Highmorianum, capable of giving entrance to a common quill. In the meatus formed posteriorly in the ethmoid bone, under the cornet of Morgagni, are the orifices of the posterior ethmoidal cells; at the back part of this cornet, and a little above it, is the orifice of the sphenoidal sinus. Immediately under the forepart of the inferior spongy bone is the orifice of the Ductus ad Nasum. This membrane is laid smoothly on the septum of the nose.

The Schneiderian or mucous membrane, when well injected, shows great vascularity; its reflections into the sinuses are not, however, so thick or vascular as the other parts of it. The surface which looks towards the cavity of the nose is villous like velvet, and is studded with many mucous follicles which pass obliquely into it, some of them being arranged in rows. It adheres closely to the bones, and that surface, in the compactness of its texture, resembles periosteum.

Its nerves are derived from three sources:—

1. The OLFACTORY, or Nerves of Smelling. They pass on each side of the crista galli, in two rows, perforating the cribriform plate, and taking a coat of dura mater, which renders them strong and fibrous. One row is spread on the membrane, covering the upper part of the ethmoid bone, and descends as low as the inferior edge of the middle spongy bone; the other is distributed to the membrane of the nasal septum and its fibres descend somewhat lower. The fibrillæ of these nerves terminate on the nasal surface of the membrane.

Fig. 86.

THE THREE TURBINATED BONES AND ASSOCIATED PARTS OF THE NASAL FOSSA, COVERED BY THE SCHNEIDERIAN MEMBRANE, WITH A VIEW OF THE DISTRIBUTION OF THE NASAL NERVE.

1. Olfactory Nerve.
2. Its Bulb, below which is seen the Plexiform Distribution of the Olfactory Filaments on the Upper and Middle Turbinated Bones.
3. Trigeminus Nerve with the Ganglion of Gasser.
4. Its Superior Maxillary Division, showing its Connection with Meckel's Ganglion, from which Filaments are given off to anastomose with those of the Olfactory Nerve,
5. And with Branches of the Nasal Division of the Ophthalmic Nerve, 6, 7. These Figures, 5, 6, and 7, also mark the Upper, Middle, and Lower Turbinated Bones.
8. Superior Meatus.
9. Middle Meatus.
10. Lower Meatus.
11. Posterior Palatine Nerves from Meckel's Ganglion, distributed to the hard and soft Palate.
12. Cartilaginous Orifice of the Eustachian Tube.

2. The SPHENO-PALATINE NERVE comes from the Spheno-Palatine Ganglion through the spheno-palatine foramen, and gives fibres to the septum and lateral parts of the nose. One of the former dips into the anterior palatine foramen, joins with its fellow from the other side, and forms a ganglion near the roof of the mouth.

3. The Nasal Nerve of the First Branch of the Fifth Pair, passing through the anterior ethmoidal foramen into the cranium, dips down at the side of the crista galli into the nose, and may be traced along the nasal bone to the tip of the nose.

The nose is supplied principally with Blood from the internal maxillary artery, and from the ethmoidal branches of the ophthalmic. Its veins accompany the arteries.

SECTION VI.

THE MOUTH.

The cavity of the mouth is chiefly formed by the palatine process of the upper maxillary and palate bones, above; by the tongue, and the muscles connected with it, below; by the cheeks laterally; by the lips before; and by the soft palate behind.

The Tongue has its root at the os hyoides, and is there thin, but broad; its tip and sides, owing to the lining membrane passing a considerable way under them before it is reflected to the organ, are left free. Four pairs of muscles compose its bulk. The Stylo-Glossus, which arises from the anterior part of the styloid process, and is inserted into the side of the tongue near its root, the fibres going to the tip. The Hyo-Glossus, which arises broad and thin from the cornu, appendix, and body of the os hyoides, and forms a considerable part of the bulk of the tongue on its side. The Lingualis, which arises indistinctly from the root of the tongue on the inner side of the former muscle, and its fibres are to be traced as far as the tip. And lastly, the Genio-Hyo-Glossus muscle, the most internal of the four, lying in contact with its fellow of the opposite side. It arises from the tubercle on the posterior face of the symphysis of the lower jaw, and its fibres radiate so as to be inserted from the body of the os hyoides to the tip of the tongue. Besides these regular and well-defined muscles, there are many fibres which cross the organ in various directions, and facilitate its motion. They are the Superficialis Linguæ, forming a thin layer on the upper surface of the tongue; the Transversales Linguæ, being scattered fasciculi going horizontally, and the Verticales Linguæ, which are also scattered and go vertically.

The superior surface of the tongue, on its anterior two-thirds, is rough, from the presence of a number of eminences on it, called Papillæ. At the posterior part are about nine of them, arranged like the letter V, with the point backwards, much larger than the others. They are fixed in pits, and surrounded by a fold of the integuments; from their particular form, they have been called Papillæ Capitatæ or Maximæ. Distributed over the tongue, and scattered at irregular distances from each other, are the Papillæ Mediæ, more numerous than the others, and smaller. A third class of them occupies by far the greater part of the surface of the tongue, and are called Papillæ Villosæ. And a fourth set of them, filling up the intervals left between the others, and being the smallest of any, are called Papillæ Filiformes. It is probable that these Papillæ, except the first, are essentially connected with the function of taste, as they are abundantly supplied with nerves and bloodvessels, having a peculiar arrangement.

At the posterior part of the tongue is a fold of the membrane covering it, which rises up to join the Epiglottis cartilage; and within this duplicature is a ligamentous bridle serving to keep the Epiglottis cartilage erect; muscular fibres from the base of the tongue form its commencement. On each side of it is a small pouch, which occasionally produces some trouble from articles of food lodging in it. A little anterior to this fold is a small blind hole, receiving the central papilla maxima, and into which some mucous glands discharge their contents; it is called the Foramen Cæcum of Morgagni; and sometimes behind it is another foramen cæcum, but without a papilla. Scattered about the root of the tongue we find many mucous glands.

The lining membrane of the mouth, when the cuticle is separated from it by maceration, exhibits a surface covered with fine villi. On the lips and cheeks, under it, are situated many small glandular bodies, called Glandulæ Labiales and Buccales. It forms a frænum where it is reflected from the upper and lower lips to the centre of the jaw-bones. On the alveolar processes, its texture is more dense, constituting the gums, which closely surround the necks of the teeth. The membrane is also united to the lower side of the tongue by a frænum, on each side of which we see the orifices of the ducts of the submaxillary glands. Under the tongue, at its side, and projecting into the cavity of the mouth, but covered by the lining membrane, is the Sublingual Gland, opening by fifteen or twenty distinct orifices. On the cheeks, opposite the interstice of the second and third molar teeth of the upper jaw, is found the orifice of the duct of the Parotid Gland.

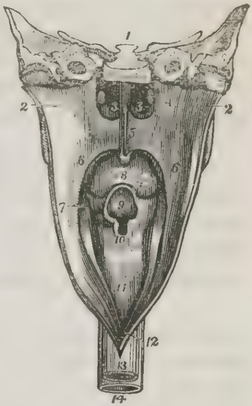
The lining membrane of the roof of the mouth is of a dense structure, having a ridge in it just under the middle palate suture, and on each side of that, transverse ridges extending towards the alveolar processes. It adheres very closely to the bone, and beneath are to be found many mucous glands of various sizes, having their excretory ducts terminating on the surface of the palate.

§ 1. OF THE FAUCES.

At the posterior part of the mouth may be seen, very distinctly, by depressing the lower jaw, an incomplete partition, which divides it from the pharynx. It is the Velum Pendulum Palati, formed by the lining membrane of the mouth reflected over several muscles. In the centre is a projection termed Uvula. On each side of the uvula the soft palate has its inferior margin terminating in two crescentic ridges, called its lateral half arches. The anterior half arch is rather more distinct than the posterior, and, arising from the side of the uvula, runs around to be inserted into the side of the base of the tongue. The posterior half arch, arising from the side of the uvula near the anterior, runs backwards and outwards, and is lost insensibly about the middle of the pharynx. Between the half arches, on each side, is placed the Tonsil Gland, the surface of which is commonly so reticulated that it might readily be mistaken for ulceration. The space between the lateral half arches is the Fauces, and the anterior opening into it is the Isthmus of the Fauces.

Fig. 87.

THE PHARYNX LAID OPEN AND VIEWED FROM BEHIND.



1. A Section carried transversely through the Base of the Skull.
2, 2. The Walls of the Pharynx drawn to each side.
3, 3. The Posterior Nares, separated by the Vomer.
4. The Extremity of the Eustachian Tube of one side.
5. The Soft Palate.
6. The Posterior Pillar of the Soft Palate.
7. Its Anterior Pillar; the Tonsil is seen in the niche between the two Pillars.
8. The Root of the Tongue, partly concealed by the Uvula.
9. The Epiglottis, overhanging (10) the Superior opening of the Larynx.
11. The Posterior Part of the Larynx.
12. The Opening into the Œsophagus.
13. The External Surface of the Œsophagus.
14. The Trachea.

By dissecting off the membrane of the soft palate, which is continued from the mouth, several mucous glands are brought into view lying immediately under it, and also the muscular structure, which is as follows:—

1. In the anterior half arch is the CONSTRICTOR ISTHMI FAUCIUM, which arises from the middle of the soft palate near the root of the uvula, and is inserted into the side of the tongue near its root, in a line with the papillæ maximæ. It tends to close the opening between the mouth and the pharynx.

2. In the posterior half arch is the PALATO-PHARYNGEUS. It arises from the middle of the soft palate behind, near the root of the uvula, and is inserted in the

pharynx between the middle and lower constrictors and into the superior posterior margin of the Thyroid Cartilage. It draws the velum palati downwards.

3. The CIRCUMFLEXUS or TENSOR PALATI arises from the spinous process of the sphenoid bone behind the foramen ovale, and from the contiguous part of the Eustachian tube. It passes in contact with the pterygoideus internus muscle, and terminates in a broad tendon below, which, winding around the hook of the internal pterygoid process, is inserted into the soft palate near its middle, and into the posterior lunated edge of the palate bone. It spreads out, or extends the palate.

4. The LEVATOR PALATI arises from the point of the petrous bone and contiguous part of the Eustachian tube; it is on the inner side of the former muscle, and passes downwards to be inserted into the soft palate. It draws the soft palate upwards.

5. The AZYGOS UVULÆ arises from the posterior termination of the palate suture, runs through the centre of the soft palate, and ends in the point of the uvula. It draws the uvula upwards and diminishes the vertical breadth of the soft palate.

SECTION VII.

OF THE NECK.

The dissection of the head being now completed as far as the base of the jaw, the student may next proceed to the study of the neck, and commence it by making one incision through the skin, along the clavicle and upper edge of the sternum, another from the chin, over the thyroid cartilage to the sternum, and a third from the chin to the upper part of the ear. The flap thus marked out is to be raised carefully, without cutting up a superficial membrane that lies below the skin, and is called Fascia Superficialis Colli.

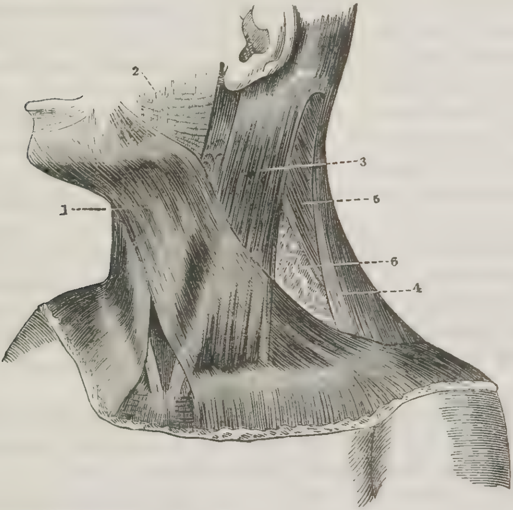
The FASCIA SUPERFICIALIS CERVICIS, or COLLI, is a continuation of the fascia spread in front of the abdominal muscles, and there called Fascia Superficialis Abdominis; it passes from these muscles to the thorax, and afterwards to the neck. Its connection with the clavicle and sternum is not very strong, and it goes from them over the neck to the face, being slightly fastened to the base of the lower jaw in advance of the masseter muscle. It is spread over the submaxillary and parotid glands, is fixed to the mastoid process, to the meatus auditorius, and to the zygoma; in the latter place it is continuous in some measure with the fascia temporalis. The existence of this membrane is thought by Mr. Colles, of Dublin, to obscure the affections of the neck and of the parotid gland, by checking the development of tumors, rendering their fluctuation and particular feel very equivocal, and giving a wrong course to the pus when they suppurate. The fascia superficialis is better marked over the parotid gland, and about the base of the jaw, than lower down.

The PLATYSMA-MYODES, or the MUSCULUS CUTANEUS, is immediately beneath the fascia superficialis, or rather is between two laminæ of it, the thicker one being the innermost. It covers a very considerable portion of the side of the neck, and extends from the thorax obliquely to the face.

It arises from the condensed cellular membrane on the upper part of the pectoralis major muscle and the deltoid just below the clavicle, and nearly the whole length of this bone. Its fibres are much more pale than those of other voluntary muscles, are collected into longitudinal fasciculi constituting a plane of scarcely a line in thickness, and terminate in the integuments of the lower jaw and cheek. It is slightly attached to the lower jaw, and not unfrequently runs into the muscles of the lower part of the face.

When the whole muscle is in action, it elevates the skin of the neck. The external jugular vein is seen nearly in the centre of it, in the same direction with the fibres of the muscle, between it and the sterno-mastoid. Upon the upper part of this muscle there is occasionally a thin, distinct plane of fibres crossing it, and running into the depressor anguli oris. This is the Musculus Risorius of Santorini.

Fig. 88.

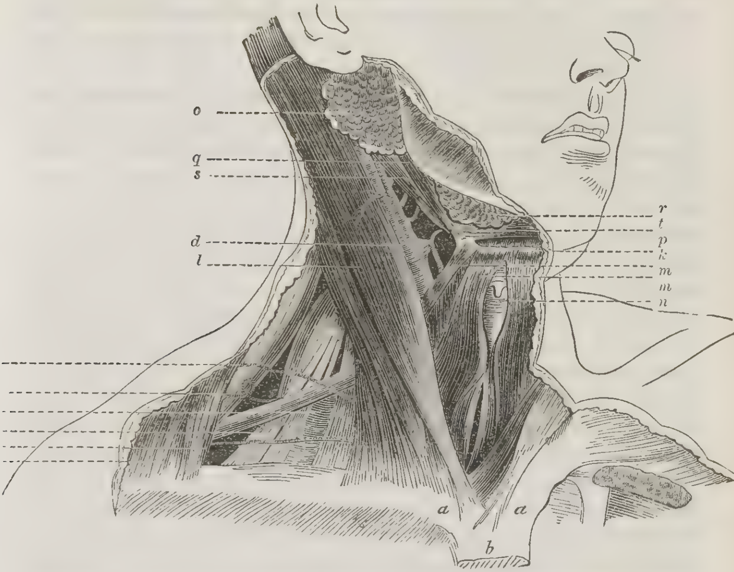


1. Platysma Myodes Muscle.
2. Scattered Fibres of the same, forming the Musculus Risorius of Santorini.
3. Sterno-Cleido-Mastoid Muscle.
4. Trapezius.
5. Splenius.
6. Posterior Large Triangle of the Neck, bounded in front by the Sterno-Cleido-Mastoid, behind by the Trapezius, and below by the Clavicle.

The STERNO-CLEIDO-MASTOIDEUS is beneath and decussates the last muscle. It forms always a prominent feature in the outline of the neck, by passing obliquely from the upper front part of the thorax to the base of the cranium.

It arises tendinous and fleshy from the edge of the upper part of the sternum, and fleshy from the sternal end of the clavicle. These origins are separated by a considerable fissure; they soon unite, and are inserted tendinous into the mastoid process, and into the part of the superior transverse ridge of the cranium next to it.

Fig. 89.



LATERAL VIEW OF THE NECK, WITH THE SKIN, PLATYSMA, AND CERVICAL FASCIA REMOVED.

a, a. Sternal ends of the Clavicles.
b. Upper part of the Sternum.
c. Third portion of the Subclavian Artery.
d. Primitive Carotid Artery dividing into the internal and external Carotids.
e. Posterior Scapular Artery.
f. Transverse Cervical or Suprascapular Artery.
g. Brachial Plexus of Nerves.
h. Trapezius Muscle.
i. Tendon of the Omo-hyoid Muscle.
k. Anterior belly of the Omo-hyoid.
l. Sterno-Cleido-Mastoid Muscle.
m, m. Sterno-hyoid Muscles.
n. Larynx.
o. Parotid Gland.
p. Submaxillary Gland.
q. Posterior Belly of the Digastric Muscle.
r. Anterior Belly of the same.
s. Stylo-hyoid Muscle.
t. Hyoid Bone.

It draws the chin towards the sternum. This muscle is to be detached from its origin, and allowed to hang aside by its insertion, in order to get at the parts beneath. We shall then see two narrow, handsome, ribbon-like muscles on each side of the middle line of the trachea; they are the sterno-hyoideus and sterno-thyroideus. But before we go to the dissection of them, it is necessary to look at another fascia of the neck; the

Fascia Profunda Colli, or Cervicis. When the origin of the sterno-cleido-mastoideus is turned to one side, the Fascia Profunda of the neck is brought into view. This membrane arises from the larynx, forms a thin capsule to the thyroid gland, and, being closely attached to its inferior margin, it descends by investing the sterno-hyoid and thyroid muscles, being well marked on their anterior surfaces. It is firmly fastened to the upper edge of the sternum, the sternal end of the clavicles, and to the cartilages of the first ribs, forming an elastic and resisting membrane from the larynx to the thorax. By turning off the sterno-hyoid and thyroid muscles from their attachment to the sternum, the fascia profunda will be seen still more distinctly, passing behind them, from the inferior margin of the thyroid gland to the upper bone of the sternum; this lamina of it is inserted into the sternum twelve or fifteen lines below its upper edge. It incloses or surrounds the transverse vein and the arteria innominata.

Beneath the fascia profunda, are the trachea, the roots of the arteries of the head and upper extremities, and the trunks of their veins. There is much loose cellular and adipose matter placed at the lower part of the neck beneath this fascia, between it and the trachea, and through which the thyroid veins with their ramifications pass. This last circumstance must always render suppurations and operations in the part highly dangerous, as the pus may form fistulæ under the sternum; moreover, the continual motion of the part in respiration, prevents adhesion from forming, and therefore disposes to ulceration. An ingenious idea on the uses of this fascia, and of the sterno-hyoid and thyroid muscles as connected with it, was suggested by the late Allan Burns. He conceived that they were a defence to the upper part of the thorax, and sustained, in an operation, the atmospheric pressure, which, without them, would fall upon the trachea, and produce difficulty of breathing, from the air not passing through the larynx with sufficient rapidity to keep pace with the dilatation of the thorax. He illustrates this opinion by a case, very much in point, of a gentleman who had lost this fascia and the muscles by suppuration, and who was afterwards incommoded by atmospheric pressure upon the trachea at this place.* Mr. Velpeau, on the contrary, asserts that cutting through it, in opening abscesses and in operations, has no such consequences.

The external borders of the fascia profunda are continued into the sheaths of the great vessels of the neck. It and the fascia superficialis are also continuous with each other along the anterior edge of the sterno-cleido-mastoideus.

Within the inferior maxilla, at its angle, is a ligamentous expansion connected with the pterygoideus externus muscle, which is spread out between the styloid process and the ramus of the lower jaw. This membrane, called the stylo-maxillary ligament, is joined by the fascia superficialis at its inferior edge, just before the upper part of the sterno-mastoideus, whereby its breadth is increased downwards in the neck, giving it somewhat the condition of a vertical septum of that region; at its lower edge it runs into the sheath of the great vessels of the neck. Through its lower part, penetrate the stylo-hyoideus and digastricus muscles, and the upper part separates the parotid from the submaxillary gland. It is felt like a cord, extending downwards and backwards, below the angle of the maxilla inferior. It is connected at its internal edge with the compages of the nerves and vessels of the part, in such a manner as to forbid description, but

* The late Dr. Jason O. B. Lawrence, who, to the great regret of all who knew him, died prematurely, in 1823, in the midst of his labors and usefulness in anatomy, informed me that this fascia profunda is well developed in the neck of the cat; and that, having occasion to remove it in an experiment, the respiration of the animal was conducted with great difficulty, amounting almost to suffocation. This is a good confirmation of Mr. Burns's hypothesis.

the practical anatomist will find no difficulty in discovering and understanding it.

Below this septum, a round ligament, like a nerve, passes from the extremity of the styloid process to the appendix of the os hyoides. Like the fascia superficialis, it is only the sheath for muscles which it surrounds, and is called fascia, from having some development of fibrous matter in its substance.

Before proceeding farther, the student should now examine the glands as found in the parts adjacent to the jaw.

SECTION VIII.

OF THE GLANDS OF THE HEAD AND NECK.

The Parotid Gland (Glandula Parotis) is the largest of the three, and of a very irregular figure, as this depends on the space into which it is crowded. It reaches from the zygoma downwards to the angle of the jaw, occupying the space from the mastoid process and meatus auditorius, to the ramus of the jaw, and extending from the skin externally to the styloid process, styloid muscles, and the tendon of the digastricus internally; it is there only separated from the internal carotid artery by these parts internally; its connections are numerous and exceedingly intricate. It is removed in the dead subject from the contiguous parts with great difficulty, and in the living subject its complete and safe extirpation is nearly impracticable. The portio dura nerve, and the external carotid artery, have to penetrate directly through its substance in order to arrive at their destinations.

It has been observed that this gland has no capsule, but is covered externally by an extension of the fascia superficialis of the neck; from the interior face of this fascia many prolongations are sent off, which penetrate the gland in every direction, separating its lobules from each other, and conducting the bloodvessels and nerves through its substance. The substance of the gland is formed of small, rounded granulations, of a light pink color, united into lobules of various forms; an arteriole may be injected, going to each of them.

The parotid gland is elongated at its anterior margin into a point, lying on the posterior part of the masseter muscle. From the upper part of this point, proceeds the parotid duct across the masseter muscle, about eight lines below the zygoma; and according to the observations of the late Dr. Physick, in a line from the under part of the lobe of the ear to the tip of the nose. The parotid duct (Ductus Stenonianus) is about the size of a crow-quill, and formed by the coalition of branches from ramuscles, which unite successively. The gland is sometimes divided into two lobes, in which case each has an excretory duct that joins the other half an inch in front of the anterior edge of the gland. The common duct lies close to the masseter muscle, and may easily be overlooked by the young anatomist; forwards, it dips over the edge of this muscle, into a fatty mass between it and the buccinator, and, perforating the latter, has its orifice in the mouth, opposite the second large molar tooth of the upper jaw.

Sometimes, at the posterior part of this duct, between it and the zygoma, a small gland is situated, varying in its size and form, and called by Haller the Accessory of the Parotid.

The Submaxillary Gland (Gland. Sub-Maxillaris) is irregularly ovoid. It is situated below the Platysma-myodes in the space bounded by the digastric muscle below, the mylo-hyoid towards the mouth, and the body of the lower jaw externally, and is in contact with the facial artery. It almost touches the parotid gland behind, being separated from it only by the septum sent in from the fascia superficialis, and at the posterior edge of the mylo-hyoideus it touches the sublingual gland.

Its color and structure is the same with that of the parotid gland, except in the capsule of cellular membrane with its internal prolongations being much looser. It has an excretory duct (Ductus Whartonianus), arising in the same way by ramuscles, but much thinner, and more extensible, than the parotid duct; it penetrates between the back edge of the mylo-hyoid and the hyoglossus muscle, and continues between the genio-hyoglossus and

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the sublingual gland; from the latter, it receives occasionally several branches; it terminates by an orifice on the side of the frænum linguæ near its anterior edge.

The Sublingual Gland (Glandula Sublingualis) is placed under the lining membrane of the mouth, between the side of the tongue and the mylo-hyoid muscle, and being oblong, is parallel with the genio-hyoglossus, where the latter is about to join the tongue.

This gland is not uniform in the arrangement of its excretory ducts. Sometimes it has fifteen or twenty excretory orifices in the lining membrane of the mouth; on other occasions, several of these short ducts are collected into one or two principal trunks (Ductus Riviniani) which open either directly into the mouth, or into the duct of Wharton. By turning up the tip of the tongue, the projection of this gland is readily seen, as well as several salivary granulations, or little glands, which border on it.

Lymphatic Glands. Medical men are often consulted on the subject of indurated and not very painful swellings in the neck, which most frequently are enlarged lymphatic glands. In a course of dissections these should by no means be overlooked, as they are very numerous. They vary much in size and number, being for the most part flattened ovals; some are not more than two lines in their long diameters, others are nine or ten lines long. They are both superficial and deep-seated.

Between the skin and the insertion of the sterno-mastoid muscle, there are from four to six; in the interstices just above the clavicle, between the posterior edge of the sterno-mastoid muscle and the anterior edge of the trapezius, bordering on the external jugular vein, there are half a dozen. Between the skin and the parotid gland there are two, one above and the other below. On the submaxillary gland, and at its anterior and posterior extremities, there are eight or nine. It is supposed, by respectable surgeons, that several asserted cases of extirpation of the parotid and of the submaxillary gland, have amounted actually only to the removal of some of these lymphatic glands in a state of enlargement, though these glands themselves have occasionally been removed.

The deep-seated lymphatic glands are also very abundant; along the course of the great cervical vessels, but principally between them and the anterior edge of the trapezius muscle, there are about twenty. Between the lower edge of the thyroid gland and the sternum on the trachea, there are four, and this chain is continued downwards towards the heart, by the existence of several on the side of the œsophagus, trachea, and great bloodvessels.

Passing now to the median line of the neck the dissection of the muscles between the chest and os hyoides may be readily made before examining the bloodvessels and nerves of the neck.

The STERNO-HYOIDEUS arises thin and fleshy on the interior of the thorax, from the approximated surfaces of the cartilage of the first rib, the clavicle, and the first bone of the sternum; it passes upwards, somewhat obliquely, and is inserted into the inferior edge of the base of the os hyoides.

It draws the os hyoides towards the sternum.

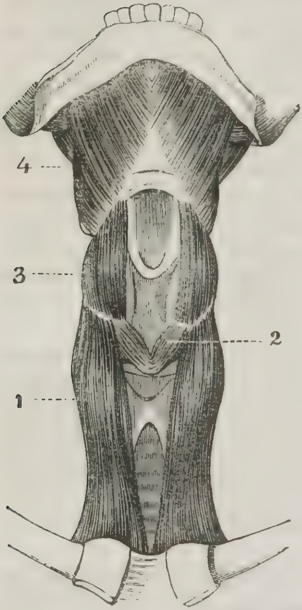
The STERNO-THYROIDEUS is beneath the last, and concealed in a considerable degree by it. It arises fleshy from the interior surface of the sternum, about an inch below its upper margin, and from the cartilage of the first rib; diminishing in breadth somewhat as it ascends, it is inserted obliquely into the side of the thyroid cartilage.

It draws this cartilage towards the sternum.

The THYROID GLAND (Gland. Thyroidea), consisting of two lobes united by an isthmus, is placed on the first and second rings of the trachea on the sides of the larynx, extending upwards laterally by the cricoid cartilage, to the thyroid. It resembles a pair of saddle-bags in its general outline; the upper edge, however, being very much excavated or crescentic, with the horns pointing upwards. The isthmus passes over the second ring of the trachea, and is firmly fixed to it by a short cellular

Fig. 90.

Muscles of the Larynx and Front of the Neck.



1. Sterno-Thyroideus.
2. Crico-Thyroideus.
3. Thyro-Hyoideus.
4. Mylo-Hyoideus.

substance. Duverney and Sœmmering, in their plates, represent a muscle passing on the left side of the larynx, from the base of the os hyoides to the upper edge of the thyroid gland, to which they give the name of Levator Glandulæ Thyroideæ. Its occurrence in this country, is, I presume, exceedingly rare, as out of several hundred subjects which I have superintended the dissection of, but few examples of it have been noticed.

It may be observed, however, that a process of the isthmus looking like a muscular slip, is frequently formed on the left side, and goes up to the base of the os hyoides, and that sometimes a few filaments are detached to the gland from the thyreo-hyoid or crico-thyroid muscle.

This gland is covered in front by the sterno-hyoid and thyroid, and laterally by the omo-hyoid and sterno-mastoid muscles. It is of a dark brown color, has a capsule from the contiguous cellular membrane, or fascia, besides its own proper coat. The structure of it is very imperfectly understood; the most that we know is, that it is extremely vascular; when cut into, or inflated, it exhibits a great number of cells communicating with each other, of different sizes, and containing an unctuous and somewhat transparent fluid, and that it has no excretory duct.

The probability is, that it is a diverticulum of blood from the salivary glands, during the intermittence of their action; and from the sympathy between it and the brain, in goitre, it may exercise a corresponding function on this organ during its intervals of repose. On each side of the neck are three large salivary glands, the Parotid, the Submaxillary, and the Sublingual.

The THYRO-HYOIDEUS arises obliquely from the side of the thyroid cartilage externally, and is inserted into a part of the base, and nearly all the cornu of the os hyoides. It looks like a continuation of the last.

Use: To approximate the os hyoides and the thyroid cartilage.

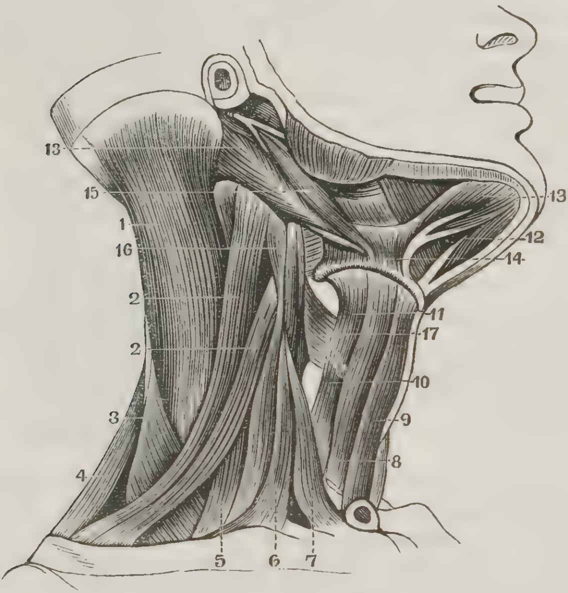
The OMO-HYOIDEUS passes obliquely across the neck, from the superior edge of the scapula to the os hyoides. It is a thin narrow muscle divided into two bellies, one at each end, by an intermediate tendon; its inferior part is concealed by the trapezius muscle, its middle, where the tendon exists, crosses the great vessels of the neck and is covered by the sterno-cleido-mastoid muscle, and its upper extremity is overlapped by the platysma-myodes.

It arises from the scapula just behind the notch in its superior costa, and, curving somewhat downwards in its course, is inserted into the lower edge of the base of the os hyoides next to its cornu.

It draws the os hyoides downwards.

The DIGASTRICUS is a double-bellied muscle placed at the upper side of the neck, and passing from the back part of the base of the head to the chin. It arises, principally fleshy, from the fossa of the temporal bone at the inside of the mastoid process; as the muscle descends towards the os hyoides, its middle part is converted into a round tendon, which passes through the stylo-hyoideus muscle, and is fixed by a ligamentous loop to the cornu of the os hyoides. After this, the muscle becomes again fleshy

Fig. 91.



Muscles of the Neck.

1. Splenius Capitis.
2. Levator Scapulæ.
3. Serratus Posticus Superior.
4. Rhomboideus Minor.
5. Scalenus Posticus.
6. Scalenus Medius.
7. Scalenus Anticus.
8. Omo-hyoideus, cut off below.
9. Sterno-hyoideus.
10. Sterno-thyroideus.
11. Thyro-hyoideus.
12. Digastricus of the left side.
13. Digastricus of the right side.
14. Tendinous Attachment of Os Hyoides and Digastricus.
15. Stylo-hyoideus.
16. Rectus Capitis Anticus Major.
17. Constrictor Pharyngeus Inferior.

and is inserted into the inside of the base of the maxilla inferior at the side of the symphysis. It receives an accession from the base of the os hyoides.

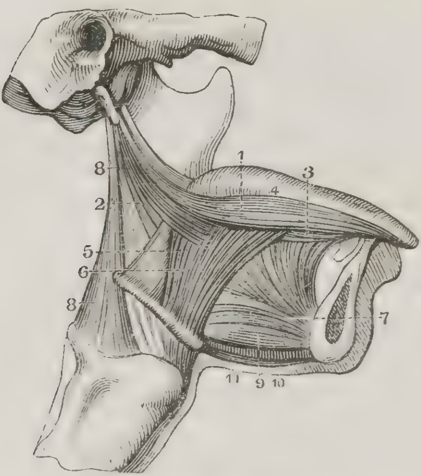
It draws the os hyoides upwards when its extremities are fixed, and throws the head backwards and thereby opens the mouth, when the lower jaw is fixed upon a level of the same height, as pointed out by Mr. Hunter. By raising the posterior belly of this muscle we get a better view of the styloid muscles, which are three in number, and placed within it.

The STYLO-HYOIDEUS is the more superficial of the three, and arises tendinous from the middle and inferior part of the styloid process of the temporal bone, and being perforated as mentioned, by the tendon of the digastricus, is inserted tendinous into the cartilaginous juncture of the base and cornu of the os hyoides.

It draws the os hyoides upwards and backwards.

The STYLO-GLOSSUS is within and above the other; it

Fig. 92.



MUSCLES OF THE TONGUE.

1. Stylo-glossus.
2. Stylo-hyoideus.
3. Lingualis.
4. Dorsum of the Tongue.
5, 6. Hyoglossus.
7. Genio-hyoglossus.
8. Stylo-pharyngeus.
9. Genio-hyoideus.
10. Raphé of the Mylo-hyoideus.
11. Digastricus.

arises from the upper internal part of the styloid process, tendinous and fleshy, and is inserted into the side of the root of the tongue, forming thereby a part of its structure.

It draws the tongue backwards.

The STYLO-PHARYNGEUS is more deeply situated than either of the other two muscles. It arises from the inner side of the styloid process near its root, and runs into the inside of the pharynx, between the middle and upper constrictors, opposite the tonsil gland. It afterwards descends between the lining membrane of the pharynx and the middle and lower constrictors, and is inserted into the posterior margin of the thyroid cartilage.

It draws the larynx and pharynx upwards.

The MYLO-HYOIDEUS forms the floor of the mouth and suspends the tongue; it arises from a ridge at the root of the alveolar process of the lower jaw, extending from the last dens molaris to the chin. Its fibres converge inwards, and are inserted into the corresponding fibres of the opposite side, by a white tendinous line placed between it and its fellow, and extending from the base of the os hyoides to the chin. This muscle lies above, so as to be concealed by the anterior belly of the digastricus; and when it contracts, it draws the os hyoides upwards and projects the tongue.

The GENIO-HYOIDEUS is immediately above the last; by turning down the anterior edge of which, it is seen. It arises tendinous from the tubercle, on the posterior side of the symphysis of the lower jaw, and, increasing somewhat in breadth, is inserted into the anterior part of the base of the os hyoides.

It draws the os hyoides upwards and forwards. By removing this muscle we bring into view

The GENIO-HYOGLOSSUS, which arises also tendinous from the tubercle on the inside of the maxilla inferior, near the symphysis, and immediately after its origin spreads itself after the manner of a fan. Its inferior fibres are inserted into the base of the os hyoides; and the remainder, by their diverging, are inserted into the tongue its whole length, constituting a part of its substance. The muscles of the opposite sides are in contact, and throw the tongue into a great variety of positions, according to the fibres which are brought into action.

The HYO-GLOSSUS is just on the exterior of the last. It arises from the side of the base and part of the cornu of the os hyoides, and from its appendix, and is inserted into the side of the tongue. It draws the tongue inwards and downwards.

The LINGUALIS may also be seen in part in this dissection. It is one of the intrinsic muscles of the tongue, and lies on the inner side of the last. For a farther account of the muscles of the tongue, see the article MOUTH, p. 270.

The dissection having now sufficiently exposed the deeper parts of the neck, the student may turn his attention to the arrangement of the bloodvessels and nerves of this region.

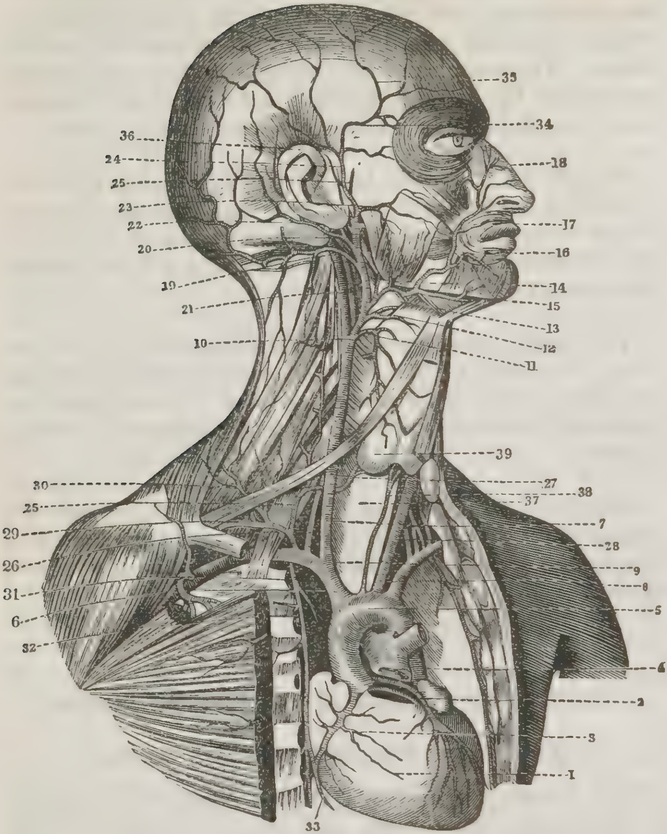
SECTION IX.

OF THE BLOODVESSELS OF THE NECK AND HEAD.

§ 1. ARTERIES OF THE NECK AND HEAD.

The RIGHT PRIMITIVE CAROTID ARTERY is a branch of the arteria innominata, and the left a branch of the aorta; their course differs somewhat at first, the right being more oblique; afterwards, the course and distribution are uniform in both. A regular ascent is performed in front of the cervical vertebræ, at the side of the œsophagus and pharynx, no branch being sent off till the carotid is near the os hyoides and just below its cornu. Here it divides into two branches, of nearly equal size, the Internal and the External Carotid; the first is intended for the brain, and the last for the external parts of the

Fig. 93.



ARTERIES OF THE NECK.

1. Heart.
2. Left Coronary Artery.
3. Right Coronary Artery.
4. Pulmonary Artery cut through.
5. Arch of the Aorta.
6. Innominata Artery.
7. Right Primitive Carotid.
8. Left Subclavian.
9. Division of the Innominata into the Right Primitive Carotid and Right Subclavian.
10. Division of the Primitive Carotid into External and Internal Carotid.
11. Superior Thyroid Artery.
12. Lingual Artery.
13. Facial or External Maxillary Artery.
14. Inferior Palatine Artery.
15. Submental Artery.
16. Inferior Labial Artery.
17. Superior Labial Artery.
18. Lateral Nasal Branch.
19. Occipital Artery.

20. Posterior Auricular Artery.
21. Ascending Pharyngeal Artery.
22. Division of the External Carotid into Temporal and Internal Maxillary Artery.
23. Transverse Facial Artery.
24. Temporal Artery.
25. Middle or Deep Temporal Artery.
25′. Inferior Thyroid Artery.
26. Vertebral Artery.
27. Point at which the Vertebral Artery enters the opening in the Transverse Process of the Sixth Cervical Vertebra.
28. Left Superior Intercostal Artery.
29. Transverse Cervical Artery.
30. Posterior Scapular Artery.
31. Internal Mammary Artery.
32. Mediastinal Branch.
33. Superior Phrenic Artery.
34, 35. Anterior Temporal Artery.
36. Posterior Temporal.
37. Trachea.
38. Middle Thyroid Artery, an anomalous branch of the aorta sometimes met with.
39. Thyroid Body.
40. Ascending Cervical Artery, a branch of the Inferior Thyroid.

neck and head. In the lower part of the neck, just above the sternum and clavicle, the primitive carotid is covered by the sterno-hyoideus and thyroideus, and by the sternal portion of the sterno-cleido mastoideus, and on a line with the lower part of the thyroid cartilage it is crossed obliquely by the omo-hyoideus muscle.

This point may be ascertained, before the skin is opened, by a horizontal line drawn across the neck over the first ring of the trachea, and consequently below the larynx. In its whole course, it is joined with the par vagum, sympathetic, and descendens noni nerves.

Parallel with the larynx, the carotid may be felt pulsating very distinctly, being there covered only by the platysma myodes and integuments. It is contained in a sheath of condensed cellular membrane common to it, the internal jugular vein, and the par vagum nerve.

The External Carotid (Carotis Externa), at the place of bifurcation, is interior and anterior to the internal carotid, and it immediately begins to send off branches in the following order:—

1. The Arteria Thyroidea Superior passes in a meandering direction to its principal destination, the thyroid gland, through which it is minutely distributed, anastomosing freely with the other arteries of the same

body. In its course it sends off the laryngeal branch, which penetrates to the muscles of the larynx, between the os hyoides and thyroid cartilage, and also some twigs to the same, between the thyroid and cricoid cartilages. It sends off some smaller branches to contiguous parts.

2. The ARTERIA LINGUALIS arises just above the last; it goes very near the cornu of the os hyoides, by penetrating the hyo-glossus muscle. At the root of the tongue, it sends off a transverse branch (the Dorsalis Linguæ), and a little farther forwards it divides into two branches, one going to the Sublingual Gland (the Ramus Sublingualis), the other distributed through the tongue (the Arteria Ranina).

3. The ARTERIA FACIALIS arises near and above the other; it is tortuous, passing under the stylo-hyoid, and the tendon of the digastric muscle. It is much involved with the submaxillary gland, to which it sends branches. The submental branch, arises from it here and passes forwards to the symphysis of the jaw, near the exterior margin of the mylo-hyoid muscle.

The Arteria Facialis mounts over the lower jaw just before the masseter muscle; to the latter, it sends a branch; forwards, it sends another towards the front of the chin, called Inferior Labial. On a line with the corner of the mouth, it sends to the lips the Inferior and the Superior Coronary Arteries, which are very tortuous and surround the mouth, anastomosing freely with those of the other side.

After this the facial artery ascends to the internal canthus of the eye, sending off intermediately, a branch to the ala nasi, and another which anastomoses with the infra-orbitar artery; at the internal canthus it anastomoses with branches from the ophthalmic, and then terminates.

4. The ARTERIA PHARYNGEA INFERIOR is one of the smallest of the original branches, and arises from the carotid opposite to the lingual; it is small, being distributed on the pharynx, and sending a branch, the Posterior

Meningeal Artery, upwards through the foramen lacerum, to the dura mater.

5. The ARTERIA OCCIPITALIS is large, and arises opposite to the facial and sometimes higher up. It crosses over the internal jugular vein and the eighth pair of nerves, passes the base of the cranium under the insertion of the muscles going to the mastoid process, and is distributed to the parts lying on the occipital bone; its upper branches anastomose with those of the temporal artery.

Its collateral branches, are one to the dura mater, through the posterior foramen lacerum, or the mastoid foramen, another to the interior parts of the ear, and a considerable one to the complexus and adjacent muscles of the neck.

6. ARTERIA POSTERIOR AURICULARIS, arises from the carotid at the lower edge of the parotid gland, and passes backwards and upwards between the meatus externus and the mastoid process, to terminate behind the ear. It is distributed principally to the contiguous superficial parts, but one branch goes up the stylo-mastoid foramen (whence the name of stylo-mastoidea) to the tympanum, and to the labyrinth.

The EXTERNAL CAROTID, while detaching these branches, becomes very deeply situated under the digastric and stylo-hyoid muscles and the inferior end of the parotid gland; afterwards it penetrates the substance of the gland, becoming much involved in it, and sending off several small twigs. It ascends through the gland and exhibits itself superficially just before the meatus externus, in mounting over the root of the zygoma. When on a line with the neck of the inferior maxillary bone it sends off a very large branch, the Internal Maxillary, to the parts beneath the ramus of the bone. The origin of this branch is to be considered as the termination of the name external carotid, and the trunk is afterwards called Temporal.

The ARTERIA TEMPORALIS goes to the side of the head;

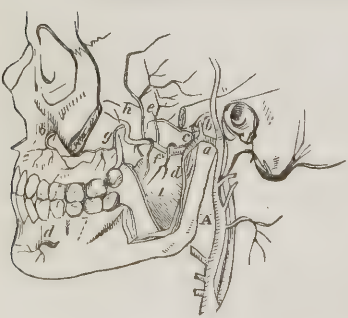
while it is still imbedded in the parotid it sends off the Transversalis Facici, which crosses the masseter muscle below the Parotid Duct, and is distributed to the contiguous parts. The temporal artery then rises over the zygoma, where a branch leaves it which penetrates the temporal fascia, and is distributed to the muscles beneath; this is the Middle Temporal artery.

The temporal artery having got an inch or so above the zygoma, divides into an anterior and a posterior branch. The first is distributed forwards on the temple, inosculating with its fellow of the other side, and with the facial and the ophthalmic artery. The second is distributed laterally on the parietal region, also anastomosing with its fellow of the opposite side, and with the occipital artery.

The Arteria Maxillaris Interna can be got at only by removing the ramus of the jaw; it winds around the neck of the inferior maxilla, and proceeds in a very tortuous manner to the bottom of the zygomatic fossa, touching in its course the inferior surface of the temporal bone. It passes between the internal and external pterygoid muscles immediately after leaving the carotid artery; and sends off several branches, generally in the following order:

Fig. 94.

The Internal Maxillary Artery and its Branches.



A. External Carotid Artery.
a. Internal Maxillary Artery.
b. Arteria Tympanica.
c. Arteria Pterygoidea.
d. Dentalis Inferior.
e. Arteria Meningea Parva.
f. Arteria Buccalis.
g. Arteria Alveolaris, or Maxillaris Superior.
h. Arteria Meningea Magna.
o. Infra-Orbitalis.
d. Anterior Mental Artery.

1. Arteria Tympanica, to the cavity of the tympanum through the glenoid fissure.

2. The Arteria Meningea Parva, to the dura mater through the foramen ovale.

3. The Arteria Meningea Magna, to the dura mater through the foramen spinale. From this trunk, sometimes proceeds the lesser meningeal to the dura mater, through the foramen ovale.

4. The Arteria Maxillaris, or Dentalis Inferior, to the teeth of the lower jaw, through the posterior mental foramen.

5. The Temporales Profundæ, two branches to the temporal muscle; the first is the posterior deep, the second the anterior deep temporal artery, not seen in the cut.

6. The Arteria Pterygoidea, branches to the pterygoid muscles and to the masseter.

7. The Arteria Buccalis, a branch to the buccinator and zygomaticus major.

8. The Alveolaris, or Maxillaris Superior, to the great and small molar teeth of the upper jaw.

9. The Infra-Orbitalis, through the infra-orbitar canal, to the canine and incisor teeth and to the cheek.

10. The Palatina Superior, through the posterior palatine canal to the soft palate, not shown in the cut.

11. The Pharyngea Superior, to the upper part of the pharynx.

12. The Spheno-Palatina, which is the terminating branch of the internal maxillary artery, and is very minutely distributed to the Schneiderian membrane by two trunks, one on the septum of the nose, and the other on its external side.

The Internal Carotid Artery (Carotis Interna), at its commencement, is generally dilated like an incipient aneurism; it curves much in getting to the foramen caroticum of the temporal bone, and is in contact with the par vagum and sympathetic nerves; it sends off no intermediate branches. In the canal it gives a branch to the tympanum, and as it lies on the side of the sella turcica it gives the anterior and posterior arteries of the cavernosus sinus. Its subsequent history is merged in that of the ophthalmic and cerebral arteries.

The following arteries belong to the neck, and are derived from the Subclavian, as it is about to get between the scaleni muscles.

1. The Arteria Vertebralis, which goes into the canal of the transverse processes of the vertebræ of the neck at the sixth, and following its course, enters the foramen magnum occipitis, to be distributed to the brain. It is very tortuous at the first and second vertebræ.

2. The Arteria Thyroidea Inferior, which passes up obliquely to the thyroid gland, between the great vessels of the neck and the vertebræ; in its distribution it anastomoses very freely with the other thyroid arteries. This artery generally sends off

The Cervicalis Anterior, a small artery, which is distributed along the course of the scaleni muscles, and which comes frequently from some other branch of the subclavian.

3. The Cervicalis Posterior is very tortuous, and runs horizontally across the root of the neck to the trapezius muscle and the subjacent ones. It arises most frequently either from the subclavian or the inferior thyroid.

§ 2. VEINS OF THE HEAD AND NECK.

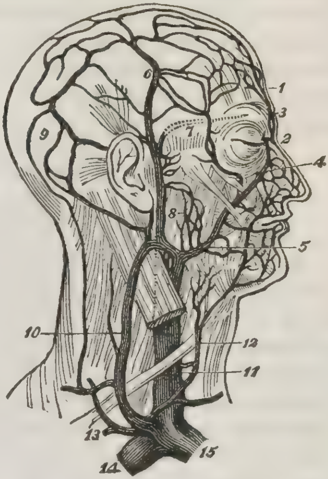
The Veins of the face and external parts of the head correspond so much with the distribution of the arteries that they may be considered as having nearly the same course; to undertake the description of them, therefore, would be almost a repetition of what has been said.

Towards the angle of the jaw they are collected into a common trunk, the external jugular (Jugularis Externa), which crosses obliquely the sterno-cleido-mastoid muscle under the platysma-myodes, in the direction of the fibres of the latter, and runs into the subclavian vein just behind the clavicle, at the posterior edge of the sterno-cleido-mastoid muscle. Sometimes the external jugular, almost immediately after its formation, joins the internal jugular. On other occasions the facial vein joins the external jugu-

Fig. 95.

Veins of the Head and Neck.

1. Frontal Vein.
2. Nasal Vein, or Nasal Arch.
3. Supra-Orbitar Vein.
4. Angular Vein.
5. Facial Vein.
6. Superficial Temporal Veins.
7. Middle Temporal Vein lying beneath the Temporal Fascia, and indicated by dotted lines.
8. Masseteric Plexus.
9. Occipital Veins.
10. External Jugular.
11. Internal Jugular.
12. Anterior Jugular.
13. Scapular Veins.
14. Subclavian Vein.
15. Vena Innominata, or Brachio-Cephalic Vein.



lar; and the temporal vein, with slight accessions from the side of the face, forms a trunk which descends almost vertically under the platysma-myodes and outside of the sterno-cleido-mastoideus, to join the subclavian vein in front of the scaleni muscles. The varieties are, in short, too numerous to be recounted in this work.

The Internal Jugular Vein (Jugularis Interna) may, with propriety, be considered as the great venous trunk of the brain, being a continuation of the lateral sinus. It lies on the outside of the internal and of the common carotid artery, inclosed in the same sheath, descends into the upper mediastinum in contact with the pleura, and is joined at the internal edge of the scalenus anticus muscle by the subclavian vein. This jugular vein is occasionally much dilated, and, in the contractions of the right auricle, spreads over the carotid artery. One vein is sometimes much larger than the other.

The Upper Thyroidal Veins discharge into the internal or external jugulars; the Lower Thyroidal Veins into the transverse or subclavian veins; sometimes a trunk is formed across the upper edge of the sternum from one subclavian to the other, and above the great transverse vein; into this the inferior thyroidal veins discharge in whole or in part. The variety of arrangement is here also too great to admit of a standard description.

SECTION X.

OF THE NERVES OF THE HEAD AND NECK.

A minute dissection of the nerves of the face will scarcely be undertaken by the young student. To perform it successfully, requires much time, patience, and address; but when, by advanced study, the latter two are obtained, the labor will be fully compensated, by the pleasure and information it affords. For a very minute dissection, a lean subject is indispensable; for a common one, it is less important, and much of this dissection may be performed on the subject appropriated to the arteries.

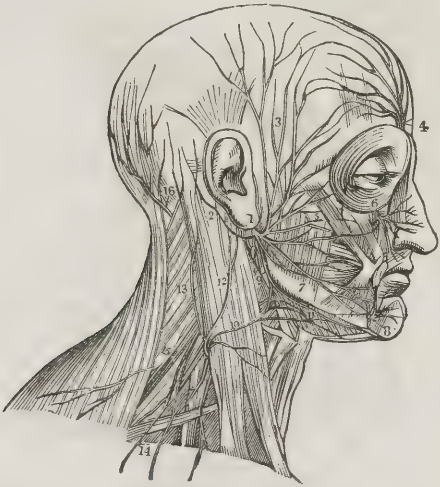
The Portio Dura, or Facial Nerve, comes out at the stylo-mastoid foramen, is almost immediately afterwards deeply involved in the parotid gland, and divides into fasciculi in its substance. Emerging at different points, it is distributed very minutely on the side of the face, sending branches to the temple which join those of the supra-orbitar nerve, branches to the cheek which join those of the infra-orbitar nerve, branches to the chin which join those of the inferior maxillary nerve, and branches to the upper part of the neck which join those of the superior cervical nerves.

The distribution of this nerve is too minute to admit of more than a general reference to it. Its branches join each other frequently, forming the network called Pes Anserinus. The dissection of it should be commenced at the stylo-mastoid foramen, or in the parotid gland, and the skin should be raised only as its branches are exposed; without this precaution the dissection will fail.

The Trigeminus, or Fifth Pair of nerves, comes next.

Fig. 96.

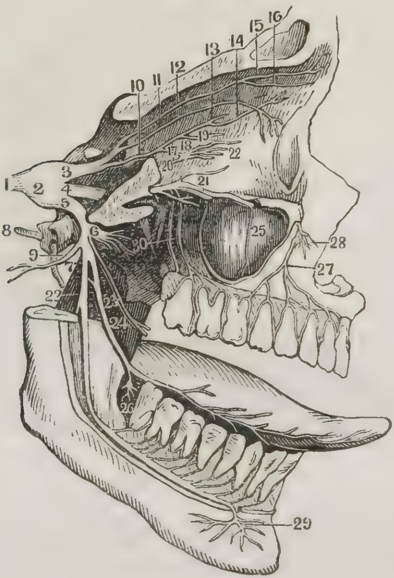
THE DISTRIBUTION OF THE FACIAL NERVE AND THE BRANCHES OF THE CERVICAL PLEXUS.



1. The Facial Nerve (Portio Dura) escaping from the Stylo-mastoid Foramen, and crossing the Ramus of the Lower Jaw; the Parotid Gland has been removed, in order to show the Nerve more distinctly.
2. The Posterior Auricular Branch; the Digastric and Stylo-mastoid Filaments are seen near the origin of this branch.
3. Temporal Branches communicating with (4) the Branches of the Frontal Nerve.
5. Facial Branches communicating with (6) the Infra-orbital Nerve.
7. Facial Branches communicating with (8) the Mental Nerve.
9. Cervico-facial Branches communicating with (10) the Superficial Cervical Nerve, and forming a Plexus (11) over the Submaxillary Gland. The distribution of the branches of the facial in a radiated direction over the side of the face, and their looped communications, constitute the Pes Anserinus.
12. The Large Auricular Nerve, one of the Ascending Branches of the Cervical Plexus.
13. The Small Occipital ascending along the Posterior Border of the Sterno-mastoid Muscle.
14. The Superficial and Deep-descending Branches of the Cervical Plexus.
15. The Spinal Accessory Nerve, giving off a Branch to the External Surface of the Trapezius Muscle.
16. The Large Occipital Nerve, the Posterior Branch of the second Cervical Nerve.

Fig. 97.

COURSE AND DISTRIBUTION OF THE THREE BRANCHES OF THE TRIGEMINUS NERVE.



1. Trunk of the Trigeminus.
2. Ganglion of Gasser.
3. First or Ophthalmic Branch.
4. Second or Superior Maxillary Branch.
5. Third or Inferior Maxillary Branch.
6. Muscular Division of the latter Nerve.

7, 8. Chorda Tympani, showing its connection with the Gustatory Nerve.

9. The Temporal Nerve.
10. The Nasal Nerve, or Oculo-Nasalis.
11. The Lachrymal Nerve.
12. Frontal Nerve.
13. Continuation of the Nasal Nerve through the Anterior Ethmoidal Foramen, into the Nose.
14. Infra-Trochlear Branch of the Nasal Nerve.
15. Supra-Orbitar Branch of the Frontal Nerve.
16. Supra-Trochlear Branch of the Frontal Nerve.
17. Branch of the Nasal Nerve to the Ophthalmic Ganglion.
18. Ophthalmic Ganglion (directly beneath the Fissure).
19. Ciliary Branch of the Nasal Nerve, going to the Ball of the Eye.
20. Branch given off from the Ophthalmic Ganglion to the inferior division of the Third Nerve.

21. Continuation of the Superior Maxillary Nerve along the floor of the Orbit.
22. Inferior Dental Nerve.
23. One of the Muscular Branches of the Inferior Maxillary Nerve.
24. Gustatory Branch of that Nerve, going to the Tongue.
25. Dental Branch of the Superior Maxillary while in its Canal, and passing between the Mucous Membrane and outer wall of the Antrum to the Teeth. The other Dental Nerves are seen behind it.
26. The Submaxillary Ganglion.
27. Anterior Dental Branches of the Upper Maxillary; Exit of the Infra-Orbitar Nerve.
29. Terminal Branches of the Upper Maxillary, distributed to the face. The Mental Nerves or Termination of the Inferior Maxillary.

Its branches are brought into view by sawing off the ramus of the lower jaw and detaching it entirely, observing to leave the pterygoid muscles by cutting close to the bone, through their insertions; when the adipose and cellular membrane is then cleared away, the second and third branches of this nerve are seen deep in the bottom of the zygomatic fossa. For the distribution of the first or ophthalmic trunk, see the "Auxiliary Parts of the Eye."

The Second, or SUPERIOR MAXILLARY branch of the Fifth pair, comes out of the cranium through the foramen rotundum, and is first seen in the upper part of the pterygoid fossa. It immediately sends forwards a branch into the infra-orbitar canal of the upper jaw-bone, which passes through it, comes out at the infra-orbitar foramen, and terminates by branches on the face. This is the infra-orbitar nerve, which just before entering the canal, sends off the Posterior Dental Nerve to supply the last three molares, and afterwards sends off the Anterior Dental Nerve to supply the canine and incisor teeth. The Bicuspid teeth are supplied by a union of filaments from the anterior and posterior dental nerves.

Afterwards, the Superior Maxillary Nerve passes downwards in two divisions, sometimes to a level with the spheno-palatine foramen, and forms the spheno-palatine ganglion, or ganglion of Meckel, from which proceed the Pterygoid, the Lateral Nasal, and the Palatine Nerves.

The PTERYGOID NERVE, retrograding through the foramen of the same name, gets into the cavity of the cranium through the anterior foramen lacerum at the point of the petrous portion of the temporal bone, and there divides; one branch joins the carotid artery (see Sympathetic Nerve), and the other, passing into the Vidian foramen, has a singular course through the ear (see Chorda Tympani).

The LATERAL NASAL NERVE consists of several filaments from the spheno-palatine ganglion; getting into the nose, they are distributed to the pituitary membrane of the outer side of the nose, and also to the same membrane where it covers the septum. One of the branches of the latter makes a long sweep, dips into the foramen incisivum, and, according to Mr. J. Cloquet, forms a ganglion with its fellow near the bottom of the canal. With this ganglion communicate branches of the palatine nerve.

The PALATINE NERVE passes through the posterior palatine canal to the roof of the mouth; it there divides into filaments supplying the lining membrane, the soft palate, the uvula, and the tonsils. In its way downwards, it sends several small twigs to that portion of the pituitary membrane which covers the inferior turbinated bone.

The INFERIOR MAXILLARY NERVE, or the Third Branch of the Fifth Pair, comes through the foramen ovale into the zygomatic fossa, and divides immediately into two branches, one of which is distributed in minute ramifications to the muscles of mastication, as the pterygoid, masseter, and temporal; it also sends a branch (the Superficial Temporal) of the size of a knitting-needle, which joins the portio dura, and, in order to get to it, adheres closely to the neck of the inferior maxilla. This last branch, from being blended with the portio dura, must, of course, as long as it remains undivided, render nugatory the section of the portio dura for tic douleureux.

The Second Branch of the Inferior Maxillary Nerve passes between the pterygoid muscles, and divides into two trunks; one of which, proceeding to the tongue, is the Lingual or Gustatory nerve, and the other, going to the lower jaw-bone, is the proper Inferior Maxillary Nerve. The first, in its progress between the pterygoid muscles is joined by the chorda tympani; it then passes above the mylo-hyoid muscle near the duct of Wharton, and advancing to near the end of the tongue is divided very minutely among the papillæ. The inferior maxillary nerve enters the posterior maxillary foramen; but while doing so, dispatches a branch, the Mylo-hyoid, to the submaxillary gland and the muscles under the jaw; it then goes in a canal in the spongy part of the bone. Very frequently it divides into two branches, the upper of which is literally the dental nerve, and is spent by dismissing ramifications to all the teeth successively. The nerve below, however, remains to come out at the anterior maxillary foramen, and is spent on the chin.

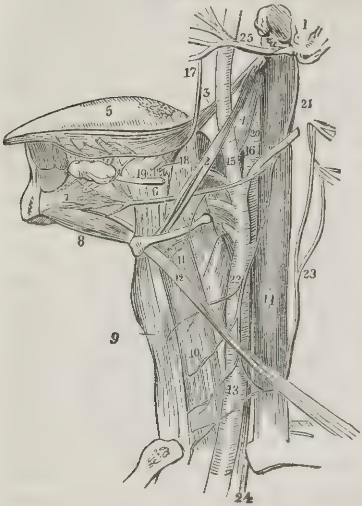
In order to proceed properly in the dissection of the Nerves of the Neck, the skin must be carefully raised from the sterno-cleido-mastoid muscle, by which means we shall see the spinal accessory nerve emerging from the muscle, and after having given a few branches to it, passing backwards, to be distributed on the anterior edge of the trapezius.

By next detaching the sterno-mastoid muscle from its origin, and turning it aside, the spinal accessory nerve will be seen, coming from the posterior foramen lacerum, where it adheres to the Par Vagum, Glosso-Pharyngeal, and Ninth Nerve; and passing obliquely behind the internal jugular vein, downwards and backwards, in order to reach the sterno-mastoid muscle.

At this stage of the dissection, a multitude of nervous filaments is seen upon the neck, going to its muscles, integuments, and other parts, and interwoven with its bloodvessels. They form an intricate plexus, derived from various combinations of the eighth and ninth pairs, the sympathetic and the proper cervical nerves, the detailed description of which is too elaborate for a dissector's manual. It is best, therefore, for the attention to be confined to leading trunks.

Fig. 98.

NERVES OF THE NECK AND TONGUE.



1. Part of the Temporal Bone.
2. Stylo-hyoid Muscle.
3. Stylo-glossus Muscle.
4. Stylo-pharyngeus Muscle.
5. Tongue.
6. Hyoglossus Muscle.
7. Genio-hyoglossus Muscle.
9. Sterno-hyoid Muscle.
10. Sterno-thyroid Muscle.
11. Thyro-hyoid Muscle, upon which is seen a branch of the Hypoglossal Nerve.
12. Omo-hyoid Muscle straightened by the removal of the Loop of Cervical Fascia through which its tendon plays.
13. Common Carotid Artery.
14. Internal Jugular Vein.
15. External Carotid Artery.
16. Internal Carotid.
17. Gustatory Branch of the Fifth Nerve, giving a Branch to (18) the submaxillary Ganglion.
19. Duct of Submaxillary Gland.
20. Glosso-pharyngeal Nerve.
21. Hypoglossal Nerve.
22. Descending Branch of the Hypoglossal.
23. Communicating Branch from the Cervical Plexus.
24. Pneumogastric Nerve emerging from between the Internal Jugular Vein and Common Carotid Artery to enter the Chest.
25. Facial Nerve, emerging from the Stylo-mastoid Foramen, and crossing the External Carotid Artery.

The GLOSSO-PHARYNGEUS, is a small nerve coming from under the internal jugular vein, adhering to it and to the other branches of the eighth pair, by condensed cellular membrane; it passes to the tongue, between the stylo-glossus and stylo-pharyngeus muscle, and on the outside of the internal carotid artery. Following the course of the stylo-glossus muscle at its internal edge, it gets to the root of the tongue, where it is distributed on its side and middle, and to the papillæ maximæ. In its course, it sends several branches to the muscles of the pharynx, and to its internal membrane.

The Ninth Pair, or the Nervus Hypoglossus, is also very deeply seated, where it emerges from the cranium, at the anterior condyloid foramen. Adhering for some distance to the par vagum, by condensed cellular membrane, it abandons the par vagum, by getting between the internal carotid artery and internal jugular vein, and crossing them obliquely, about half an inch below the glosso-pharyngeus muscle. It descends much lower in the neck than the glosso-pharyngeal, forming a large curve with the convexity downwards. It is the nearest large nerve below the glosso-pharyngeal, the order of descent being, first, the lingual branch of the fifth pair, the glosso-pharyngeal second, and the ninth nerve third.

In its descent, the Ninth nerve winds externally around the external carotid artery, just below the origin of the occipital artery. Here it is below the posterior belly of the digastricus and the stylo-hyoideus muscle. It then passes forwards somewhat horizontally, under the external jugular vein, towards the root of the tongue, where it is at the side of the hyo-glossus muscle, a little above the os hyoides, and crossed externally by the stylo-hyoideus and the tendon of the digastricus. It now ascends on the inside of the mylo-hyoideus, and divides abruptly into many ramifications which are distributed to all the muscles of the tongue, from the space between the genio-hyo-glossus and the lingualis muscle.

Where the Ninth nerve winds externally around the external carotid, it dismisses the Descendens Noni. The latter descends externally along the common carotid, connected with its theca, as far as midway between the sternum and os hyoides; and unites with ramifications from the first, second, and third cervical nerves, to form a bow under the sterno-mastoid muscle. Above this bow, the descendens noni detaches branches to the upper parts of the sterno-hyoid and thyroid muscles, and from the bow branches proceed to the lower parts of these muscles.

The Par Vagum, an important nerve, is seen immediately on separating the common carotid and the internal jugular from each other. It lies in the sheath of these vessels at their back part, and between them. Emerging from the cranium at the posterior foramen lacerum, it is somewhat swollen, adheres to the ninth nerve, and to the superior cervical ganglion of the sympathetic. It then leaves them after a short distance, assumes the position just expressed, and maintains it down the neck till it reaches the upper margin of the thorax.

Shortly after quitting the cranium, it sends to the middle constrictor of the pharynx the Nervus Pharyngeus.

Just below the pharyngeal nerve the Laryngeus Superior is sent off, which descends obliquely under the Internal Carotid, and divides at the posterior edge of the thyro-hyoid membrane into an internal and external branch. The former being the largest, and above, proceeds between the os hyoides and the thyroid cartilage under the thyro-hyoideus muscle to the internal parts of the larynx, where it is distributed by minute ramifications to the arytenoid muscles, epiglottis, and lining membrane. The external branch, descending, is disposed of by ramifications to the pharynx, to the lower part of the larynx, and to the thyroid gland.

In the upper part of the thorax, or the lower part of the neck, the par vagum abandons the common carotid, and passes before the subclavian artery on the right side, and before the aorta on the left. Immediately after passing these vessels, it divides into an anterior and a posterior trunk; the first is the continued par vagum, the second the recurrent, or the Inferior Laryngeal.

The Laryngeus Inferior has the same distribution on both sides; but it is to be observed that on the right it winds around the subclavian artery, and on the left it winds around the arch of the aorta. The nerve is then deeply situated on the side of the trachea, and ascends to the larynx, sending branches to the trachea, the œsophagus, and the thyroid gland. It is minutely distributed by terminating ramifications to the small muscles of the larynx, and to its lining membrane. One of its branches, at the inferior part of the larynx, communicates with filaments from the laryngeus superior.

The Laryngeus Inferior has branches connecting it with the inferior cervical ganglion of the sympathetic, the cardiac plexus, and the pulmonary plexus of nerves.

The Nervus Sympatheticus is also on the back part of the great vessels of the neck, close to the vertebræ. It is commonly said to be in their sheath; but this is a loose if not an inaccurate style of speech, as, by passing a knife-handle below the sheath, and raising it up, it will be seen that the sympathetic is not one of its contents; but, on the contrary, that it is fastened somewhat tightly to the longus colli and the contiguous muscles, by cellular membrane.

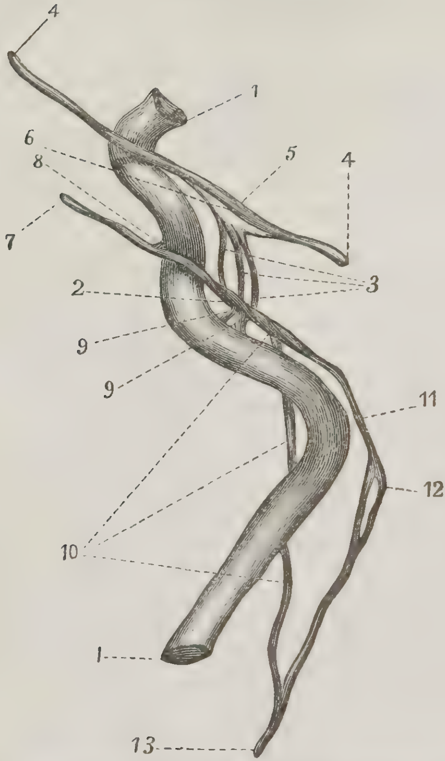
The sympathetic nerve arises by filaments of the pterygoid and the sixth nerve, which form a network in the carotid canal, around the artery; a little above, or below, the termination of the canal, they unite by two principal trunks to form one nerve.

This cord is close to the eighth and ninth nerves, and opposite to the second cervical vertebra; its swells out into the Superior Cervical Ganglion, which, for the purposes of description, is sometimes considered as the first of the series; it then descends, and opposite to the space between the fifth and the sixth cervical vertebræ it forms the Middle Cervical Ganglion, which is much smaller and more irregular than the first. The sympathetic is traced with some difficulty from this, in consequence of numerous branches coming from it. A trunk, however, may be found, as the continuation of it, which passes to the interval between the head of the first rib and the transverse process of the last cervical vertebra, where another enlargement occurs, denominated Inferior Cervical, or First Thoracic Ganglion.

The first Ganglion is increased by filaments from the sub-occipital, the first, second, and third cervical nerves. The second Ganglion receives filaments from the fourth, fifth, and sixth cervical nerves. The third Ganglion receives filaments from the sixth and seventh cervical, and the first dorsal nerves. From these ganglia proceed the cardiac nerves.

The Nervus Phrenicus is a small, straight, insulated

Fig. 99.



ORIGIN OF THE SYMPATHETIC NERVE, AND ITS CONNECTION WITH THE CAROTID ARTERY.

1, 1. The Carotid Artery.
2. Ganglion of Laumonier.
3. Three Branches proceeding upwards from the Ganglion to the Sixth pair of Nerves.
4. The Sixth Nerve divided into two Fasciculi.
5. Superior Fasciculus.
6. Inferior Fasciculus, separated from the Superior one by a Sulcus; the three Branches of the Ganglion unite with the Inferior Fasciculus.
7. Deep Petrosal Branch of the Vidian Nerve, running to join the Ganglion.
8. Twig from the latter branch, going to the Tunics of the Artery.

9, 9. Two Filaments sent from the Ganglion to the Artery.
10. A Branch proceeding behind the Artery and from the Ganglion to join the Trunk of the Intercostal Nerve.
11. A principal Branch descending from the Ganglion, on the upper surface of the Artery, partially divided at 12 by a fissure.
13. Trunk of the Sympathetic Nerve.

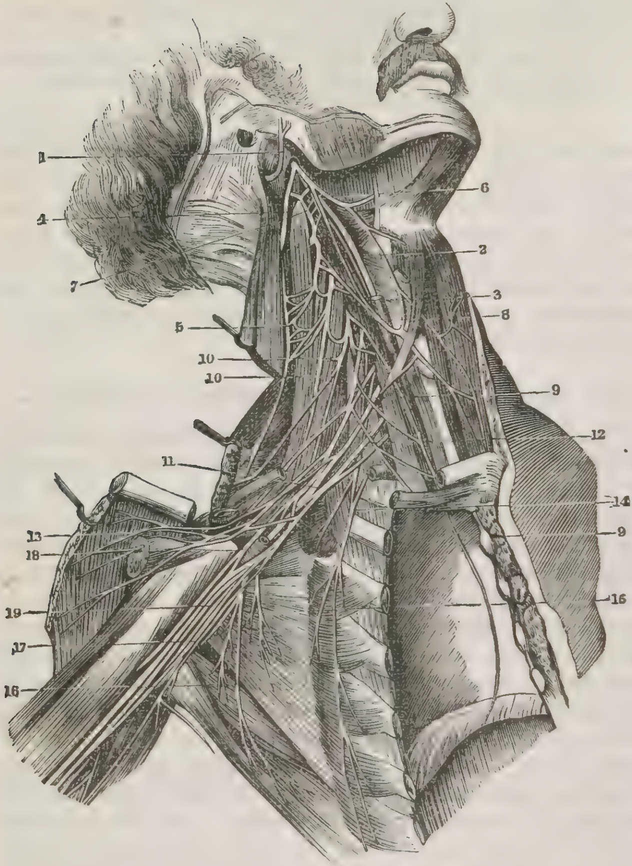
nerve, coming principally from the third cervical, but also derived, in part, by filaments from the second and fourth. It is found on the humeral side of the great vessels of the neck, removed a considerable distance from them, and lying upon the anterior face of the scalenus anticus muscle. It descends into the thorax between the subclavian artery and vein, and within the anterior end of the first rib.

The detailed account of these nerves is as follows:—

The Phrenic Nerve arises from the anterior fasciculus of the second and third cervical, and is assisted generally by two or three filaments from the upper part of the brachial plexus. It descends vertically on the humeral side of the internal jugular vein, but removed a considerable distance from it, and is attached by cellular substance to the front of the scalenus anticus muscle. Getting in its descent to the internal margin of the latter, it passes into the thorax from the neck, by the side of the descending cava on the right, between it and the pleura; it then goes along the superior mediastinum to the pericardium, to the side of which it adheres in front of the root of the lungs, being between the pericardium and the corresponding portion of the pleura; it finally reaches the diaphragm, to which it is distributed. On the left side, with the exception of the descending cava, and of its being turned somewhat out of its way by the projection of the point of the heart, its course is the same.

The nerve, getting to the diaphragm, is spread out in a radiated direction by branches which interchange filaments. Some of the branches are distributed in its thickness, and upon its concave surface. On the right side, some of these branches pass through the opening for the Ascending Vena Cava, and thus getting into the abdomen, anastomose with the solar plexus and with the pneumo-

Fig. 100.



CERVICAL AND BRACHIAL PLEXUSES OF NERVES OF THE RIGHT SIDE.

1. Facial Nerve.
2. Pneumogastric Nerve.
3. Internal Carotid Artery.
4. Spinal Accessory Nerve.
5. Anastomoses of the Spinal Accessory Nerve with the Cervical Plexus.
6. Hypo-glossal Nerve, giving off its Descending Branch.
7. Anterior Branch of the first Cervical Nerve, Anastomosing with the Hypo-glossal Nerve and with the Pneumogastric.

8. Descending Cervical Branch of the Cervical Plexus, Anastomosing with the corresponding Branch of the Hypoglossal.
9. Phrenic Nerve.
10, 10. Deep Cervical Branches of the Cervical Plexus.
11. Brachial Plexus.
12. Branch to the Subclavian Muscle, sending a Filament to the Phrenic Nerve.
13. Anterior Thoracic Branches.
14. Lateral Thoracic Branch, or the Branch to the Great Serrate Muscle.
15, 16, 17. Subscapular Branches going to the Subscapular, Latissimus, and Greater Teres Muscles.
18. Axillary Artery, surrounded by a sort of Sheath, formed by Branches going to the Arm.
19. Brachial Branches.

gastric nerve. The phrenic nerve of the left side is nearer to the root of the lung than that of the right, in consequence of the projection of the apex of the heart on that side. Its distribution, in other respects, does not present any remarkable difference from the other. It sends some filaments to the lower part of the œsophagus.

The Par Vagum, before it gives off the recurrent nerve, sends off one or more twigs to join the cardiac plexus; it also contributes to the same when the recurrent nerve is separating from it. From a little below this place, the par vagum sends off the Anterior Pulmonary Plexus, derived principally from two branches, a large and a small one, which subdivide and go in front of the trachea and of the root of the lungs. The ramifications of this plexus follow generally the bronchia and blood-vessels into the substance of the lungs, but some of them are turned into the cardiac plexus.

The trunk of the par vagum proceeds then on the outside of the bronchia, and a little lower down, behind it, passes in contact with the posterior surface of the root of the lungs. Here it gives off successively five or six branches of different magnitudes, which leave the main trunk almost at right angles, divide and subdivide, and, following the bronchia, are spent upon its ultimate ramifications in the lungs. These branches constitute the Posterior Pulmonary Plexus.

After the posterior pulmonary plexus is given off, the par vagum, remaining still considerable, attaches itself to the œsophagus, being split into three or four fasciculi, which spread out and unite again. From the crossing of the bronchi to the joining with the œsophagus, a great many small ramifications are sent to the œsophagus, forming a plexus on it; some are sent also to the aorta.

The Left Par Vagum is situated on the anterior lateral surface of the œsophagus, and the Right Par Vagum on the posterior lateral surface, each, however, adhering to its own side, and forming a plexus which partially surrounds the œsophagus. They pass through the Foramen Œsophageum of the diaphragm, along with the œsophagus, and their fibres are reassembled into more considerable trunks. The left par vagum is distributed along the lesser curvature of the stomach, between the cardia and the pylorus, to the anterior side of the stomach, to the lesser omentum; and some of its branches extend to the left hepatic and the solar plexus. The right par vagum surrounds with its branches the cardiac orifice of the stomach, supplies the under side and great curvature, sends branches along the gastric artery to unite with the hepatic and splenic plexuses, and one trunk to the solar plexus.

The Sympathetic Nerve is principally employed in the thorax in supplying the heart. With this view, it sends to it three nerves on the right side and two on the left, called Cardiac.

The Right Superior Cardiac is derived by several filaments from the upper cervical ganglion, joined by some from the superior laryngeal nerve. They unite into one trunk, which accompanies the common carotid on its external surface as far as the middle cervical ganglion; here the trunk divides, one part of it, and the smaller, running along the carotid and arteria innominata to the aorta, the other joining a plexus just below the middle cervical ganglion.

The Middle or Great Cardiac Nerve arises from the inferior part of the middle cervical ganglion, passes along the external surface of the carotid artery, and crosses the subclavian in front, just at its root; it then goes along with the arteria innominata for a little distance, and terminates in the upper part of the cardiac plexus.

The Third or Inferior Cardiac Nerve comes from the lower cervical ganglion, by several filaments, which unite into a smaller number to form a plexus, and which descends behind the subclavian artery, between the innominata and trachea, to the posterior part of the arch of the aorta.

On the left side, the Upper Cardiac nerve originates in the same way as on the right, from the first cervical ganglion and upper laryngeal. Attending the common carotid, it is increased by fibrillæ from the sympathetic, between the first and second ganglia. In the upper part of the thorax, this nerve is between the carotid and subclavian arteries, and at their roots some of its branches go in front of the aorta and others behind it. The second cardiac nerve of the left side is derived from the middle and lower cervical ganglia of the sympathetic. Several branches being dispatched by the two ganglia, they form a plexus which surrounds the subclavian, at the origin of the inferior thyroid and transversalis colli arteries. From this plexus, several cords proceed longitudinally behind and before the subclavian artery to the aorta, and here, being joined to branches from the upper cardiac nerve, they form a plexus on the anterior and posterior faces of the aorta.

The Cardiac Plexus consists of a very considerable number of nervous filaments, formed by the combination of the cardiac nerves on both sides, with branches sent off from the recurrent nerves, and the par vagum. It is placed between the arch of the aorta and the lower part of the trachea and bronchiæ, and is fixed in loose cellular and adipose membrane at its upper part. Below, its meshes are much involved with the glands about the bifurcation of the trachea, and on the aorta its branches lie

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very close to this vessel, being bound to it by the internal lamina of the pericardium.

Several branches of the plexus wind over to the front of the aorta and pulmonary artery, where they are also confined closely to these vessels by the internal lamina of the pericardium, and are seen to enter into their structure. The cardiac plexus, penetrating from the base of the heart to the root of the aorta, is diffused through the muscular structure of the former, its trunks following the courses of the coronary arteries.

The SYMPATHETIC NERVE, from the last cervical ganglion, proceeds over the head of the first rib, and descends through the thorax in contact with the heads of all the ribs, and exterior to the pleura. At the upper edge of the head of each rib it forms a ganglion, which unites with the intercostal nerve behind it by one or two branches.

Fig. 101.

GANGLIA OF THE SYMPATHETIC IN THE CHEST (THE GANGLIA ARE REPRESENTED LARGER THAN NATURAL). THE WOOD-CUT IS TAKEN FROM PART OF A PLATE IN MR. SWAN'S WORK.

a. Aorta.
b. First Rib.
c. Eleventh Rib.
1. First Thoracic Ganglion.
2. Last Thoracic Ganglion.
3. Large Splanchnic Nerve.
4. Small Splanchnic Nerve.
5. Smallest Splanchnic Nerve.
6. Part of the Brachial Plexus.

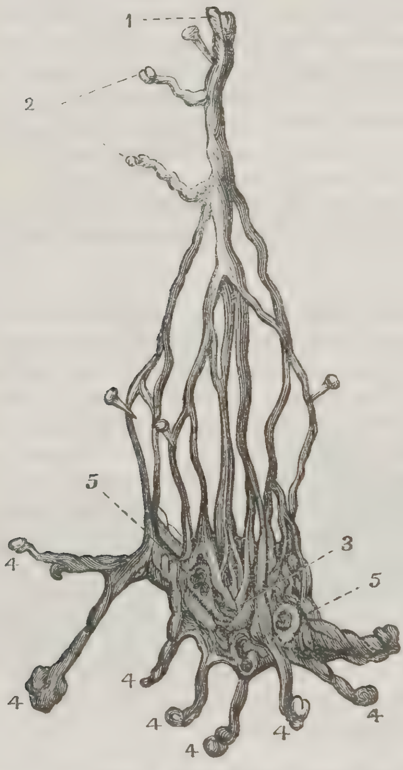
At the lower part of the thorax, it penetrates into the abdomen beneath the crus of the diaphragm; it then proceeds forwards and downwards on the spine, between the tendinous crus of the diaphragm and the psoas-magnus muscle, and lies on the side of the bodies of the lumbar vertebræ, being near the vena cava on the right side, and the aorta on the left. About the middle of the body of each lumbar vertebra it forms a ganglion, which joins by one or two nervous filaments with the corresponding lumbar nerve, which filaments pass between the bone and the psoas muscle. From the loins, the sympathetic descends into the pelvis on the inner side of the foramina of the sacrum; here also it forms a ganglion corresponding with each sacral nerve, and detaches a filament to join it. Finally, the sympathetic terminates on the os coccygis, where the ultimate branches of the opposite sides unite.

From several of the upper ganglia of the sympathetic in the thorax fibrillæ depart, which join the posterior pulmonary plexus, and are also distributed in the form of a plexus on the aorta. From the sixth, seventh, eighth, ninth, and tenth thoracic ganglia, branches are sent off, which, descending obliquely on the sides of the vertebræ, unite successively, so as to form a considerable trunk, the Great Splanchnic Nerve, which gets into the abdomen through the foramen in the diaphragm, for the aorta, or by penetrating the crus. From the tenth and eleventh dorsal ganglia, filaments are, in like manner, successively sent off, which form one trunk, that penetrates into the abdomen through the crus of the diaphragm; this constitutes the Lesser Splanchnic Nerve, which, in part, unites to the great splanchnic nerve, and the remainder goes to the renal plexus.

The Great Splanchnic Nerve, having entered the abdomen, terminates in the Semilunar Ganglion. This ganglion is situated on the crus of the diaphragm, and on the sides of the cœliac and superior mesenteric arteries. It is frequently formed rather by a congeries of small ganglia arranged in a lunated form, than by a single one. These small ganglia are united by a reticular work of nerves, and from them proceeds a very intricate and combined network of nervous fibres, called the Solar Plexus.

Fig. 102.

Great Splanchnic Nerve and the Semilunar Ganglion.



1. Trunk of the Nerve, which divides below into six or eight branches.
2. Branches that anastomose with the Dorsal Nerves.
3. Semilunar Ganglion.

4, 4, 4. Branches given off by the Ganglion to form the Superior Mesenteric Plexus.

5. Two Foramina in the Ganglion.

The Solar Plexus is behind the stomach, above the pancreas, and surrounds with its branches the cœliac, superior mesenteric, and renal arteries. It is formed from the semilunar ganglia of both sides, and to their ramifications are added some from the par vagum and phrenic nerves. That portion of the solar plexus on the cœliac artery assumes the name of cœliac, and dismisses ramifications in the course of the gastric, hepatic, and splenic arteries to the viscera supplied by them, as the stomach, liver, pancreas, and spleen.

The Superior Mesenteric Artery has around it the SUPERIOR MESENTERIC PLEXUS, which accompanies the arterial branches to the right side of the colon, to its transverse portion, and to all the small intestines. From the inferior part of this plexus proceeds a detachment in front of the aorta, to the inferior mesenteric artery, which supplies the left side of the colon and the rectum.

From the lower part of the solar plexus arises the RENAL PLEXUS, which surrounds the emulgent artery, and is distributed to the kidney and to the capsula renalis. The renal plexus detaches near the kidney a few fibres, which being joined by others from the first or second lumbar nerves, accompany the spermatic artery, and are therefore called the Spermatic Plexus. In the male they are distributed on the cord and testis, and in the female on the ovarium and Fallopian tube.

From the lower part of the renal and solar plexus, there proceeds a reticulated structure of nerves in front of the aorta, as low down as its bifurcation. This is joined by fibres on each side, from the sympathetic of the loins. It divides, and following the course of the hypogastric artery on each side, is distributed to the bladder, rectum, and vesiculæ seminales of the male, and to the uterus, vagina, bladder, and rectum of females. This is the HYPOGASTRIC PLEXUS, which is farther increased by filaments from the sacral parts of the sympathetic.

The other nerves of the trunk consist of the DORSAL, the LUMBAR, and the SACRAL. Each arises as a solitary trunk from its appropriate spinal ganglion, and very soon divides into anterior and posterior fasciculi. The posterior is distributed to the muscles of the back, but the anterior has a destination not so uniform.

The anterior branches of the dorsal nerves are all connected to the ganglia of the sympathetic, and running between the internal and external intercostal muscles are distributed to the parietes of the thorax and abdomen. The first dorsal nerve joins the axillary plexus. The second sends a branch through the external intercostal muscle to the axilla, which joins with a branch of the internal cutaneous nerve of the arm, and is supposed, as it also sends a filament to the lower cervical ganglion of the sympathetic, to establish the sympathy between the arm and the heart in angina pectoris. The third dorsal also sends a branch to the axilla.

The upper lumbar nerves are employed upon the integuments of the abdomen, and in the formation of the lumbar plexus, which supplies the front of the thigh and leg. The lower lumbar nerves, and the sacral, form the Sciatic plexus, which supplies the posterior parts of the lower extremity.

The farther consideration of the spinal nerves is referred to the account of the anatomy of the extremity. But an examination of those forming the axillary plexus will be useful at this stage of the dissection.

Each of the Cervical Nerves, including the suboccipital, after its ganglion is formed by the posterior fasciculus of the spinal marrow, exists as a trunk, which is joined by the anterior fasciculus of the same. This common trunk gets out between the transverse processes of the cervical vertebræ, and is immediately divided into an anterior and a posterior branch. The posterior branches are distributed to the muscles and to the integuments, which lie on the posterior part of the cervical vertebræ, but the anterior branches are variously disposed of. The sub-occipital, and the first three cervical nerves, have their anterior branches going principally to the muscles which arise from the transverse processes of the vertebræ, and to the skin of the neck. Each of these anterior branches is united by filaments to the nerve above and below it, and a sort of plexus is formed, which lies over the levator scapulæ muscle. Filaments are also sent from the anterior branches of the cervical nerves, which join with the spinal accessory nerve, the hypoglossal, the portio dura, the sympathetic, and the phrenic, in various ways, which are too numerous to be mentioned here.

The AXILLARY PLEXUS, from which the nerves of the upper extremity are principally derived, arises from the anterior branches of the four inferior cervical nerves, and of the first dorsal. These branches are much larger than the posterior, and emerge between the anterior and the middle scaleni muscles. They send some very small filaments to the lower and middle cervical ganglions of the sympathetic.

[After clearing off the nerves, as well as taking out the œsophagus and trachea, the deep-seated muscles of the front of the neck demand attention. Of these there are four pairs, which are situated on the front and sides of the cervical vertebræ behind the pharynx and œsophagus, and can only be well shown by removing everything that has been before spoken of in connection with the front of the neck. The first is the Longus Colli Muscle.]

1. The LONGUS COLLI is next to the middle line of the vertebræ and arises from the sides of the bodies of the three superior vertebræ of the back, and from the anterior edges of the transverse processes of the five lower cervical vertebræ. Its fibres pass somewhat obliquely upwards and inwards, to be inserted into the front of the bodies of all the cervical vertebræ.

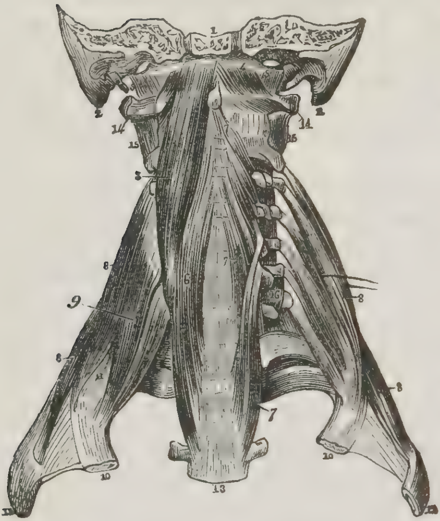
It bends the neck forwards, and to one side.

2. The RECTUS CAPITIS ANTICUS MAJOR, is placed outside the last muscle, and arises tendinous and fleshy from the fronts of the transverse processes of the third, fourth, fifth, and sixth cervical vertebræ, forms a considerable fleshy belly, and is inserted into the cuneiform process of the os occipitis just before the condyle.

It bends the head forwards.

Fig. 103.

CERVICAL MUSCLES.



1. Basilar Process of the Occipital Bone.
2. Mastoid Process.
3. Rectus Capitis Anticus Major.
4. Rectus Capitis Anticus Minor.
5. Rectus Capitis Lateralis.
6. Longus Colli, right side.
7. Same, left side.

8, 8. Scalenus Posticus.

9. Scalenus Anticus.
10. First Rib.
11. Passage of the Subclavian Artery.
12. Second Rib.
13. Third Dorsal Vertebra.
14. Transverse Process of the Atlas.
15. First Inter-transversalis Muscle.
16. Sixth Inter-transversalis Muscle.

3. The RECTUS CAPITIS ANTICUS MINOR is a very small muscle, which arises fleshy from the front of the first cervical vertebræ, near its tranverse process, and is inserted under the rectus major before the root of the condyloid process of the occipital bone.

It bends the head forwards.

4. The RECTUS CAPITIS LATERALIS is also small, and arises fleshy from the front of the transverse process of the atlas. It is inserted tendinous and fleshy into the

ridge on the outside of the condyle of the occiput, leading from it to the mastoid process.

It pulls the head a little to one side.

On the outside of these muscles, passing from the exterior edges of the cervical vertebræ to the upper parts of the thorax, are the Scaleni muscles, three in number, and named from their situation:—

1. The Scalenus Anticus arises by three distinct tendinous heads from the transverse processes of the fourth, fifth, and sixth cervical vertebræ, and is inserted tendinous and fleshy into the upper surface of the first rib, just anteriorly to its middle.

2. The Scalenus Medius arises by distinct tendons from the transverse processes of all the cervical vertebræ, and is inserted tendinous and fleshy into the upper face of the first rib, in all the space from its middle to its tubercle.

3. The Scalenus Posticus arises from the transverse processes of the fifth and sixth cervical vertebræ, and is inserted into the upper face of the second rib, just beyond its tubercle.

The last three muscles are concealed by the sterno-cleido-mastoideus, and the anterior edge of the trapezius; to be well seen, the clavicle should be loosened from the sternum, and thrown off to one side. The third Scalenus is best seen in dissecting the muscles of the spine, and resembles very much one of that class to which Albinus gives the name of Levatores Costarum. All the Scaleni elevate the ribs and bend the neck to one side. They are particularly interesting as connected with the course of the large bloodvessels and nerves of the upper extremity, which will be more particularly alluded to in the dissection of the axilla.

SECTION XI.

OF THE PHARYNX AND ŒSOPHAGUS.

The PHARYNX is a large membranous cavity placed at the posterior part of the nose and of the mouth, for opening an external communication with the cavities of the thorax and abdomen. It lies before the cervical vertebræ, being connected to them by cellular substance, is closely attached to the basis of the skull before the foramen magnum, to the posterior margin of the upper and under jaws, to the back parts of the os hyoides and of the thyroid and cricoid cartilage, and, below, it contracts so as to be continuous with the œsophagus. In consequence of these several attachments it constantly remains a patulous unoccupied cavity, having a free communication with the nostrils and Eustachian tubes above, with the mouth just below them, with the larynx still lower down, and with the œsophagus at its bottom. The lining membrane, which is expanded over it, is continuous with the lining membrane of these several cavities.

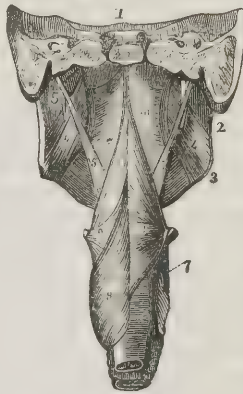
To get a good view of the pharynx, the head ought to be cut off at the root of the neck, and all the cervical vertebræ be removed; the cavity being then stuffed with baked hair, we proceed to the dissection of the muscles which form it, of which there are three pairs.

1. The CONSTRICTOR PHARYNGIS INFERIOR arises from the side of the cricoid and of the thyroid cartilage; it unites with its fellow in a white line in the centre of the posterior part of the pharynx. Its superior fibres are very oblique, covering the lower edge of the next muscle, and its inferior fibres are more transverse, being connected with the œsophagus.

2. The CONSTRICTOR PHARYNGIS MEDIUS arises from the appendix and cornu of the os hyoides, and from the round ligament connecting the latter with the cornu of the thyroid cartilage. It is inserted, in the same way as the foregoing, into its fellow and into the cuneiform process of the os occipitis just before the recti majores muscles.

Fig. 104.

A Posterior View of the Muscles of the Pharynx.



1. A Vertical Section carried transversely through the Base of the Skull.
2. The Posterior Border of the Ramus of the Lower Jaw.
3. The Angle of the Inferior Maxilla.
4. The Internal Pterygoid Muscle.
5. The Styloid Process of the Temporal Bone giving attachment to (6) the Stylo-pharyngeus Muscle.
7. The Inferior Extremity of the Stylo-pharyngeus Muscle attached to the Superior Horn and Posterior Border of the Thyroid Cartilage.
8. The Inferior Constrictor of the Pharynx.
9. The Middle Constrictor of the Pharynx, partly covered on the left side by the Inferior Constrictor.
10. The Superior Constrictor of the Pharynx.
11. The External Surface of the Mucous Membrane of the Pharynx, uncovered by muscular fibres.

3. The Constrictor Pharyngis Superior arises from the pterygoid process of the sphenoid bone, and from the upper and lower jaw-bones, behind the last molar teeth, being connected with the buccinator muscle. It is inserted into its fellow, by a white line in the middle of the pharynx, the upper end of which adheres to the cuneiform process of the os occipitis; it has its lower edge concealed by the preceding.

These muscles all assist in conveying the food from the mouth into the œsophagus.

§ 1. OF THE ŒSOPHAGUS.

The œsophagus is a tube leading from the pharynx to the stomach; it is placed between the trachea and cervical vertebræ above, passes into the thorax between the laminæ of the posterior mediastinum, in contact with the dorsal vertebræ, penetrates through the left foramen of the diaphragm, and terminates in the cardiac orifice of the stomach. (See Posterior Mediastinum.)

The Œsophagus is formed of three coats, the muscular, the cellular or nervous, and the mucous. When distended, it is cylindrical, but larger below than above. The muscular coat is very strong, consisting of two planes of fibres, the external being longitudinal, and the internal circular. The nervous coat connects together the other two; it is formed of cellular substance, which allows them to move very freely upon each other, and conducts the bloodvessels through their structure. The mucous coat is a continuation of that of the pharynx; it is covered by a very delicate cuticle, which is continued into the stomach, and forms in some animals an abrupt and well-marked termination just at the cardiac orifice. The internal coat of the œsophagus is most frequently found in longitudinal folds, which are removed by its distension; it abounds with mucous follicles, and is well furnished with bloodvessels.

SECTION XII.

OF THE LARYNX.

By the term LARYNX is understood the irregular cartilaginous tube which forms the upper termination of the windpipe. The basis of the structure is made by five distinct cartilages, and a crooked bone, the os hyoides, which is intermediate to the larynx and the tongue, serving the purposes of both.

The OS HYOIDES resembles much the letter U, and is divided into its base or curved part, and its cornua or lateral projections. It is parallel with the lower jaw and about half an inch below it. It acts as a root to the tongue; as two arms in holding out the bag-like orifice of the Pharynx; and from it is suspended the Larynx. The base of the os hyoides is broad and convex anteriorly; above, it is flattened on each side by the insertion of muscles from the lower jaw, and at its posterior part, it is excavated sufficiently to receive the tip of the little finger. At the ends of the base, the two cornu arise, separated from it by cartilage, and therefore movable; they are about an inch long, are somewhat flattened, and

Fig. 105.

A Front View of the Hyoid Bone.

1. The Antero-superior, or Convex side of the Body.
2. The great Horn of the Left Side.
3. The lesser Horn of the same side. The Horns were Ossified to the Body of the Bone in the specimen from which this figure was drawn.

have a tuberculated termination behind. On the cartilaginous interval of each side is placed a bony body, about the size of a grain of wheat, the Appendix, which stands up obliquely towards the styloid process, and is connected to its tip by a round ligament resembling a nerve; this ligament in some cases has been found ossified in the greater part of its length.

The five cartilages of the Larynx are the Thyroid, Cricoid, two Arytenoid, and the Epiglottis.

The Thyroid Cartilage (Cartilago Thyroidea) is about an inch below the os hyoides, and forms a very striking prominence in the male neck. It consists of flat sides, which are symmetrical, and united to each other by an angle slightly acute at its anterior part; the upper place of union forms the projection called Pomum Adami. The sides of this body lean over somewhat, by which its transverse diameter above is somewhat larger than that below. The upper edge is notched in front, and terminates behind by a long process on each side, called the Cornu Majus, which looks towards the end of the cornu of the os hyoides, and is connected to it by a round cord, the posterior thyro-hyoid ligament. The inferior edge is somewhat incurvated, and terminates behind by a short process on each side, the inferior cornu, or Cornu Minus, by

Fig. 106.

CARTILAGES OF THE LARYNX SEPARATED AND SEEN IN FRONT.

1 to 4. Thyroid Cartilage.
1. Vertical Ridge, commonly called Adam's Apple, formed by the Union of the two Plates or Halves.
2. Right Half.
3. Superior, and
4. Inferior Horn of the Right Side.
5, 6. Cricoid Cartilage.
7. Right Arytenoid Cartilage.

which it is fastened, by the posterior crico-thyroid ligament, to the side of the cricoid cartilage, and establishes a centre of motion between the two.

The CRICOID CARTILAGE (Cart. Cricoides) is an oval ring of unequal breadth and thickness, placed immediately below the thyroid cartilage. Its lower margin is horizontal, and affixed to the first ring of the trachea; the upper margin is very oblique, rising from before backwards, till the breadth behind is three times as great as that before. In front the cricoid cartilage is thin, behind it is thick. On the upper edge behind, on each side, a little head or convexity is formed, for establishing a sort of ball and socket joint with the arytenoid cartilage. The interior surface is flat; the exterior is marked by the muscles which lie on it.

The ARYTENOID CARTILAGES (Cart. Arytænoideæ, Triquetræ), two in number, one on each side of the upper back part of the cricoid, resemble each a triangular pyramid curved backwards, and having an excavated base.

The internal sides of the two are flat, face each other, and by the action of their muscles may be brought together; when thus joined they resemble the spout of a pitcher. In front, they are excavated somewhat irregularly. On the top of each is a little cartilaginous tubercle, about the size of a grain of wheat (Corniculum Laryngis), which is included in the soft parts, and is extremely movable. There is a regular articular cavity between the cricoid and arytenoid cartilages.

The Epiglottis Cartilage (Epiglottis) is an oval disk with an elongated pedicle below, its upper edge being thin and rounded. It is fixed behind the base of the os hyoides, and has its pedicle connected to the entering angle on the posterior face of the thyroid cartilage. The broad surfaces of this cartilage present forwards and backwards, and are above the level of the arytenoids; from this position of the epiglottis it is enabled to close the opening of the larynx, in consequence of the larynx and it being approximated by the thyro-hyoid muscle. It is very elastic, having a fibro-cartilaginous structure, and is perforated with many foramina, giving it a cribriform appearance.

The upper edge of the Thyroid Cartilage is connected to the internal edge of the Os Hyoides by a thin and somewhat elastic membrane, the Middle Thyro-Hyoid Ligament, which fills up the whole of this interval, and completes the front and lateral parietes of the Larynx. Between this membrane and the cavity in the base of the os hyoides is a small sac, and considered by some persons as a bursa mucosa. It has no connection with any other cavity, and is occasionally the seat of disease. When its secretion becomes excessive, it extends down as far as the isthmus of the thyroid gland.

Between the Epiglottis and the Thyroid Cartilage, and on the posterior face of the Thyro-Hyoid ligament, is a quantity of loose fatty matter, intermixed with small mucous glands; the perforations in the epiglottis are supposed to conduct the excretory tubes of the latter into the Larynx.

Between the Thyroid and Cricoid cartilages, in front, there is a ligamentous membrane which fills up this interval; it is the middle Crico-Thyroid ligament, and in Laryngotomy is indicated as the proper place for the operation.

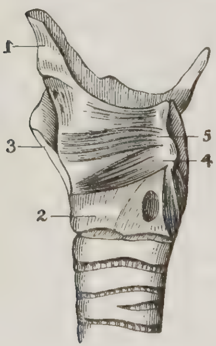
From the anterior part of the base of each arytenoid cartilage, a ligament, Thyro-Arytenoid, passes horizontally to the entering angle of the thyroid. These ligaments are not parallel, but converge from the arytenoid cartilages, and are very near each other in front. At the distance of three lines above these are two other ligaments, passing also horizontally from the arytenoids to the thyroid cartilage; they are more parallel, but have not their ligamentous character so well defined.

There are several pairs of muscles belonging to the Larynx.

1. The Crico-Thyroideus arises tendinous and fleshy from the anterior lateral surface of the cricoid cartilage, and passes upwards and backwards, to be inserted into the inferior cornu of the thyroid cartilage and the adjacent part of its inferior edge. Use, to draw these cartilages obliquely together.

Fig. 107.

Muscles and Cartilages of the Larynx.



1. Epiglottis.
2. Cricoid Cartilage.
3. Thyroid Cartilage.
4. Crico-arytenoideus Lateralis.
5. Thyro-arytenoideus.

2. The Thyro-Hyoideus, which is described in the account of the neck.

3. The CRICO-ARYTENOIDEUS POSTICUS arises from the back of the cricoid cartilage, occupying its excavation, and is inserted into the posterior part of the base of the arytenoid cartilage. Use, to draw the Arytenoid backwards, and make the ligaments tense.

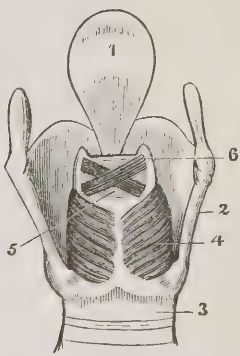
4. The CRICO-ARYTENOIDEUS LATERALIS arises from the side of the cricoid cartilage, and is inserted into the side of the base of the arytenoid. Use, to draw this cartilage outwards, and open the chink of the glottis.

5. The THYRO-ARYTENOIDEUS arises from the posterior face of the thyroid cartilage, and the ligament connecting it with the cricoid, and is inserted into the anterior edge of the arytenoid cartilage. Use, to relax the ligaments of the glottis.

6. The ARYTENOIDEUS OBLIQUUS arises from the base of one arytenoid cartilage, and is inserted into the tip of the other. It is a very small fasciculus, and sometimes only one muscle exists. Use, to close the chink of the glottis.

Fig. 108.
LARYNGEAL MUSCLES.

1. Epiglottis.
2. Thyroid Cartilage.
3. Cricoid Cartilage.
4. Crico-Arytenoideus Posticus.
5. Arytenoideus Transversus.
6. Arytenoideus Obliquus.



7. The ARYTENOIDEUS TRANSVERSUS arises posteriorly from the whole length of one arytenoid cartilage, excepting

a little part of the tip, and is inserted in a corresponding manner into the other. Use, to close the chink of the glottis.

8. The THYREO-EPIGLOTTIDEUS arises by a few fibres from the posterior face of the thyroid cartilage, near its entering angle, and is inserted into the side of the Epiglottis. Use, to draw the epiglottis downwards.

9. The ARYTENO-EPIGLOTTIDEUS arises by a few indistinct fibres from the superior lateral parts of the arytenoid cartilage, and is inserted into the side of the Epiglottis. Use, to draw the epiglottis downwards.

These last two muscles are frequently so small and undefined that they cannot be satisfactorily distinguished from the adjacent soft parts.

The cavity of the Larynx is lined by a continuation of the mucous membrane of the Pharynx. This membrane, where it establishes the upper boundary of the laryngeal cavity, forms a fold on each side, extending from the Epiglottis to the Arytenoid Cartilage; it then sinks into the cavity beneath. In extending from the upper to the lower ligament of the glottis, on each side, it forms a pouch between them, called the ventricle of Galen or Morgagni. From the lower ligament, this membrane passes to line the Cricoid Cartilage, and thence into the trachea.

The fissure between the two lower ligaments is the Rima Glottidis, and the cavity above the upper ligaments is the Glottis.

For an account of the Trachea, see page 192.

CHAPTER VII.

ANATOMY OF THE BACK.

In order to study the muscles of the back, turn the subject over on its face, and place a block in front of the neck so as to allow the head to hang a little forwards. Then, commencing at the lower part of the occiput, make an incision through the integuments from this point to the os coccygis, directly over the spinous processes of the vertebræ. Make a second incision from the upper end of the first, to the lobe of the ear on either side. Make a third cut through the integuments from the acromion process to the posterior fold of the armpit. Lastly, make a cut horizontally from the acromion process to the spine.

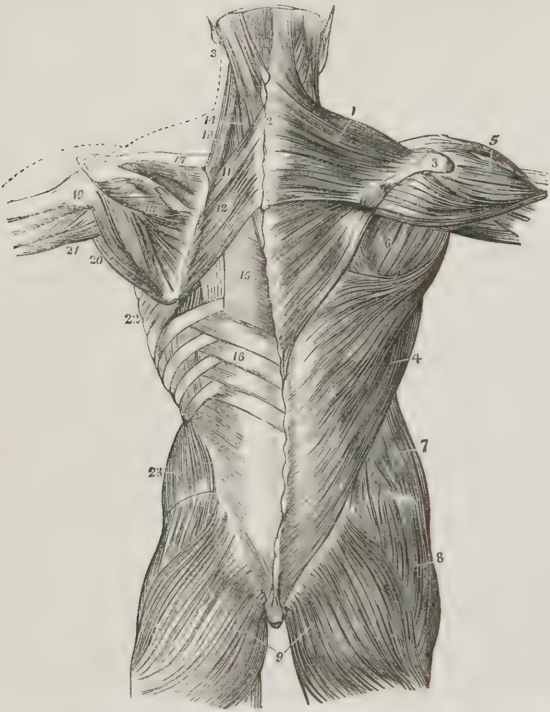
Begin the dissection at the last cut, and raise the upper and then the lower flap, in the direction of the muscular fibres, as they make their appearance. In this manner the two most superficial muscles of the back, the Trapezius and the Latissimus Dorsi, will be fairly exposed.

§ 1. MUSCLES OF THE BACK.

The Trapezius is a beautiful broad muscle, immediately under the skin, covering the back parts of the neck and thorax, and extending from the bottom of the latter to the top of the former. Its anterior edge above is parallel with the posterior edge of the sterno-cleido-mastoideus. Its posterior edge is joined with that of its fellow, and below it overlaps in part the latissimus dorsi.

It arises from the occipital protuberance, and from eight or ten lines, sometimes more, of the upper semicircular ridge of the occiput, by a tendinous membrane. It

Fig. 109.



THE FIRST AND SECOND AND PART OF THE THIRD LAYER OF MUSCLES OF THE BACK; THE FIRST LAYER BEING SHOWN UPON THE RIGHT AND THE SECOND ON THE LEFT SIDE.

1. Trapezius Muscle.
2. Tendinous portion of the same, which, with the corresponding portion of the opposite Muscle, forms a Tendinous Ellipse on the Lower Part of the Back of the Neck.
3. Acromion Process and Spine of the Scapula.
4. Latissimus Muscle.
5. Deltoid.
6. Infra spinatus and Teres Minor Muscles.
7. External Oblique of the Abdomen.
8. Gluteus Medius Muscle.
9. Gluteus Magnus.
10. Levator of the Scapula.
11, 12. Rhomboid Muscles (Small and Large).
13, 14. Splenius Muscle.
15. Aponeurosis covering the Spinal Erector Muscles.
16. Serratus Inferior Posticus Muscle.
17. Supra-spinous Muscle.

18. Infra-spinatus Muscle.
19. Teres Minor Muscle.
20. Teres Major Muscle.
21. Long head of the Triceps Muscle of the Arm.
22. Part of the Serratus Major Anticus Muscle.
23. Internal Oblique of the Abdomen.

arises also tendinously from the five superior spinous processes of the neck, through the intervention of the Ligamentum Nuchæ, and tendinously from the two lower spinous processes of the neck, and from all of the back.

It is inserted fleshy into the external third of the clavicle, tendinous and fleshy into the acromion process, and into all the spine of the scapula. Its fibres having a very extended origin, must of course converge in getting to these insertions; the upper fibres descend, the lower ascend, and the middle are horizontal.

It draws the scapula towards the spine.

In the cervical portion of these muscles, formed by the origins of both muscles united, is an elliptical expanse of tendon, lying over the ligamentum nuchæ, and extended on each side. The ligamentum nuchæ itself is a vertical septum of ligamentous matter, extending from the central line of the occipital bone to the spinous processes of all the vertebræ of the neck. At its upper part, where the spinous processes of the neck are short, this membrane is very broad, and divides completely the muscle of the two sides of the neck from each other.

The Latissimus Dorsi is situated under the skin at the lower part of the back, so as to cover its whole posterior portion. It arises by a thin, tendinous membrane, from the seven inferior spinous processes of the back, and by a thick tendinous expansion from all those of the loins and sacrum. Its origin also extends in this condition along the iliac margin of the sacrum, and from the posterior third of the spine of the ilium.* Besides which the latissimus dorsi has three or four fleshy heads, from the sides of the three or four inferior false ribs, which

* This origin frequently is tendinous at the back part of the ilium, and fleshy in front.

are interlocked with the inferior heads of the obliquus externus abdominis.

From this extended origin the fibres converge, so as to form the posterior fold of the axilla, and to terminate in a flat, thick tendon, of two inches in breadth, which is inserted into the lower part of the posterior ridge of the bicipital groove of the os humeri. The upper part of this muscle passes over the inferior angle of the scapula, and derives a fasciculus of fibres from it.

Afterwards the tendons of the two adhere closely, but have a bursa between them, at their termination. That portion of the tendon of the latissimus which is continuous with the lower edge of its flesh belly, becomes uppermost by a half spiral turn in the latter; while the upper portion is, by the same arrangement, made lowest. At the place of its insertion, it is commonly connected to the Pectoralis Major. The inferior margin of its tendon detaches a slip to the brachial fascia and the superior margin; another to the smaller tuberosity of the os humeri.

It draws the os humeri downwards and backwards.

That portion of its origin which is the tendinous membrane, arising from the spinous processes of the loins, is the Fascia Lumborum, and is common to the latissimus, the internal oblique and transversalis of the abdomen, and several other muscles to be mentioned.

The origin of the two latissimi muscles conjointly, makes a beautiful lozenge-shaped expansion, occupying its entire spinal region; the longest diameter is vertical, and just over the spinous processes; the lateral diameter extends from one crista of the ilium to the other.

Detach now the trapezius from its origin, and turn it over the shoulder. Begin also to detach the latissimus dorsi from its origin above, turning downwards the upper edge of the muscle, as the separation goes on. By doing so, in a little time, is brought into view the upper edge of the

Serratus Inferior Posticus. The origin of this muscle is inseparably united to that of the latissimus dorsi by the fascia lumborum; in order, therefore, to view it properly, let the fleshy part of the latissimus be detached from the fascia, and we shall then see that the serratus arises by this tendinous membrane, from the two inferior spinous processes of the back, and the three superior of the loins.

It is inserted by fleshy digitations into the under edges of the four inferior ribs.

It draws the ribs downwards, and is an antagonist to the diaphragm in some respects, but more particularly to the serratus superior posticus.

The removal of the trapezius above, brings into view several muscles, the most superficial of which are the Rhomboid, which, being two together, look very much like one.

The RHOMBOIDEUS MINOR is above the other. It is a narrow muscle which arises by a thin tendon, from the three inferior spinous processes of the neck, and, passing obliquely downwards, is inserted into the base of the scapula opposite the origin of its spine.

The RHOMBOIDEUS MAJOR arises also by a thin tendon from the spinous processes of the neck, and from the four superior of the back, and is inserted into all the base of the scapula below its spine.

These muscles draw the scapula upwards and backwards. Detach them from their origin, and we see next,

The SERRATUS SUPERIOR POSTICUS, arising by a thin tendon from the three inferior spinous processes of the neck, and the two superior of the back, and inserted into the second, third, fourth, and fifth ribs, by tendinous and fleshy slips, a little beyond their angles.

This muscle draws the ribs upwards. A good view of the serratus major anticus, where it is inserted into the base of the scapula, and of its situation between the thorax and scapula, is obtained at this stage of the dissection. The muscle itself, in consequence of arising on the anterior lateral parts of the thorax, has been considered in the remarks preliminary to the study of that cavity.

Between the two Serrati is an aponeurotic expansion described by Rosenmuller, which connects them with each other, and has induced some anatomists to consider them as but one muscle. It is thin and diaphanous; but has the fibrous structure very apparent, and running in a transverse direction from the spinous processes to the angles of the ribs. The superior margin of the latissimus dorsi also runs into this fascia, so as to render its own bounds somewhat undefined. This fascia, along with the ribs and vertebræ, forms that canal in which are contained the deep-seated muscles of the back.

The LEVATOR SCAPULÆ is placed between the posterior edge of the sterno-cleido-mastoideus and the anterior of the trapezius; its lower end is just above the Rhomboideus Minor. It arises by rounded tendons from the three, four, or five superior transverse processes of the neck, between the scaleni muscles and the splenius colli.

It is inserted fleshy into that part of the base of the scapula which is above the margin of its spine. As its name expresses, it draws the scapula upwards. A good view of this muscle may be obtained in the front dissection of the neck.

The SPLENIUS muscle comes next; its inferior extremity is under the serratus superior posticus, but the principal part of it is covered by the trapezius. It arises from the spinous processes of the five inferior cervical and of the four superior dorsal vertebræ.

It is inserted into the back of the mastoid process and a small part of the adjacent portion of the os occipitis, and also into the transverse processes of the two superior cervical vertebræ. It is customary to consider* the part which goes to the head as SPLENIUS CAPITIS, and the part below as SPLENIUS COLLI; the latter, in that case, is said to arise from the third and fourth dorsal vertebræ. It draws the head and neck backwards.

Between the spinous processes of the vertebræ and the angles of the ribs, on either side, there is a deep fossa

* Albinus, *loc. cit.*

Fig. 110.

1. Splenius Capitis.
2. Complexus Major.
3. Serratus Posticus Superior.

filled up entirely by muscles, some of them large and powerful. The most striking are the Sacro-Lumbalis and the Longissimus Dorsi.

The SACRO-LUMBALIS and LONGISSIMUS DORSI have a common origin from the back of the pelvis and from the lumbar vertebræ, and extend to the top of the thorax. They arise tendinous posteriorly, and fleshy anteriorly, from the posterior surface of the sacrum, by its external margin and spinous processes; they arise also tendinously from the spinous processes, and fleshy from the ends of the transverse processes of all the vertebræ of the loins, and chiefly tendinously from the posterior part of the spine of the ilium. From the under surface of this common belly, two tendinous and fleshy heads are inserted

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into the inferior edge of the transverse process of each lumbar vertebra, the smaller near its root, and the larger near its extremity. On a level with the lowest rib, and indeed, somewhat below it, a fissure occurs in the muscle which divides it into its two parts.

Fig. 111.

THIRD LAYER OF THE MUSCLES OF THE BACK.

1, 2, 6, 8. Sacro-Lumbalis muscle, turned outwards to separate it from the Longissimus Dorsi, which lies between it and the spine.
3. Point at which these two muscles are blended in one, the *Sacro-Spinalis*.
4. Complexus Minor.
5. Complexus Major.
7. Transversalis Cervicis.

The LONGISSIMUS DORSI is nearest the spine; it is inserted by small double tendons, proceeding from its internal surface, into the ends of the transverse processes of all the vertebræ of the back, except the first. It also, from its outer edge, sends long slender tendons by which it is inserted into the under edges of all the ribs beyond their tubercles, except the two inferior.

The SACRO-LUMBALIS is inserted from its outer edge into all the ribs, at their angles, by long and thin tendons, which are successively longer the higher they are inserted.

By turning over this muscle from the other, towards the ribs, one may see coming from the eight lower ribs as many slips, which run into the under surface of the sacro-lumbalis; they are the Musculi Accessorii ad Sacro-Lumbalem.

These two muscles keep the spine erect, and draw down the ribs.

Between the ends of the spinous processes and the edge of the longissimus dorsi is a muscle almost entirely tendinous, and scarcely to be distinguished from the latter, both in consequence of its close connection with it, and of its insignificant size. At its lower part, it is absolutely a portion of the longissimus, and can be separated from it only by a forced division. It is a mere string, lying along the sides of the spinous processes, and is called, from its origin and insertion, the Spinalis Dorsi.

The SPINALIS DORSI arises tendinously from the spinous processes of the two superior lumbar and of the three inferior dorsal vertebræ, and is inserted tendinously into the spinous processes of the nine superior dorsal vertebræ, except the first.

It tends to keep the spine erect.

Turn now the splenius from its insertions, and we shall see several muscles under it.

The CERVICALIS DESCENDENS is a small muscle placed at the upper portion of the thorax, between the insertions of the sacro-lumbalis and of the longissimus dorsi, into the upper ribs; it looks, at first, very much like a continuation or appendix of the first, running to the cervical vertebræ.

This muscle arises from the upper edges of the four superior ribs by long tendons; it forms a small belly, which is inserted into the transverse processes of the fourth, fifth, and sixth vertebræ of the neck, between the levator scapulæ and splenius colli, by three distinct tendons. It draws the neck backwards.

The TRANSVERSALIS CERVICIS is on the inner side of the last and in contact with it, being about the same size, and having very much the same course and appearance. It is considered as an appendage to the longissimus dorsi.

It arises from the transverse processes of the five superior dorsal vertebræ, by distinct tendons, and forms a narrow fleshy belly, which is inserted by distinct tendons also into the transverse processes of the five middle cervical vertebræ. It draws the head backwards.

The TRACHELO-MASTOIDEUS is at the inner side of the last muscle, in contact with it.

It arises by distinct tendinous heads, from the transverse processes of the three superior vertebræ of the back, and of the five inferior of the neck, and is inserted by a thin tendon into the posterior edge of the mastoid process.

The dorsal origins are frequently deficient or irregular. It draws the head backwards.

The COMPLEXUS, a fine, large muscle, is situated at the inner face of the trachelo-mastoideus, and is readily recognized by showing itself between the bellies of the two splenii capitis, just below the occiput. A quantity of tendinous matter exists in its middle, which gives it the complicated appearance from whence its name is derived.

It arises by tendinous heads from the seven superior dorsal and the four inferior cervical vertebræ by their transverse processes; also by a fleshy slip from the spinous process of the first dorsal. It is inserted into the inferior part of the os occipitis, by the surface between the upper and lower semicircular ridges, and on the outside of the vertical ridge, which exists in the middle of the bone.

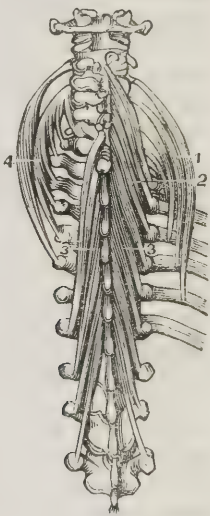
It draws the head backwards.

The SEMI-SPINALIS COLLI is a muscle which passes obliquely from transverse to spinous processes, and is situated between the complexus and the multifidus spinæ; the course of its fibres renders it difficult to be distinguished from the latter.

It arises from the transverse processes of the six upper vertebræ of the back, by tendons which are involved with those of the adjacent muscles, and passes up the neck, to be inserted into the sides of the spinous processes of the five middle cervical vertebræ.

It extends the neck obliquely backwards.

Fig. 112.



1. Cervicalis Descendens.
2. Semi-Spinalis Colli.
3. Semi-Spinalis Dorsi.
4. Transversalis Colli.

The SEMI-SPINALIS DORSI is lower down on the spine, and with difficulty distinguished from the multifidus spinæ. Like the last, it passes from transverse to spinous processes, and lies under the longissimus dorsi, between it and the multifidus.

This muscle arises by tendons connected with those of the other muscles, from the transverse processes of the seventh, eighth, ninth, and tenth dorsal vertebræ, and passes obliquely upwards to be inserted, tendinously, into the sides of the spinous processes of the two lower cervical and five upper dorsal vertebræ.

It draws the spine obliquely backwards.

The MULTIFIDUS SPINÆ lies under the muscles as yet mentioned, close to the bones of the spine; in order to see it well they, therefore, should all be cut away.

It has its commencement, tendinous and fleshy, on the back of the sacrum, being connected to its spinous processes and posterior surface, also to the back part of the spine of the ilium. It there forms a belly of sufficient magnitude to fill up much of the cavity between the spines of the sacrum and the posterior part of the ilium. It arises also from the roots of the oblique and transverse processes of all the vertebræ of the loins, of the back, and of the four inferior of the neck.

The multifidus is inserted, tendinous and fleshy, into the roots and sides of the spinous processes of all the vertebræ of the loins, of the back, and of the five inferior of the neck.

This muscle consists of a great number of small bellies, which are parallel to each other, each arising from a transverse or oblique process, and going to the spinous process either of the first or second vertebra above it.

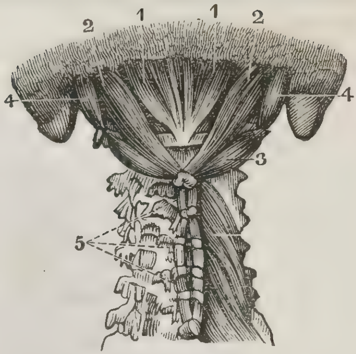
It twists the spine backwards, and keeps it erect.

Between the head and the first and second vertebræ, and between the latter two, there are on each side four small muscles, intended for the motion of these parts upon each other. They are brought into view by the removal of the complexus.

The RECTUS CAPITIS POSTICUS MAJOR arises tendinously and fleshy from the extremity of the spinous process of the vertebra dentata, and is inserted into the inferior transverse or semicircular ridge of the os occipitis, and into a part of the surface of bone below it.

Its shape is pyramidal, the apex being below. It turns the head, and also draws it backwards.

Fig. 113.



1. Rectus Capitis Posticus Minor.
2. Rectus Capitis Posticus Major.
3. Obliquus Capitis Inferior.
4. Obliquus Capitis Superior.
5. Interspinales.

The RECTUS CAPITIS POSTICUS MINOR is at the internal edge of the first. It arises tendinous from the tubercle on the back part of the first vertebra, and is inserted into the internal end of the inferior semicircular ridge of the os occipitis, and into part of the surface between it and the foramen magnum.

It is also pyramidal, with the apex downwards. It draws the head backwards.

The OBLIQUUS CAPITIS SUPERIOR arises from the transverse process of the first cervical vertebra, and is inserted into the outer end of the inferior semicircular ridge of the os occipitis, behind the posterior part of the mastoid process, and beneath the splenius muscle.

It draws the head backwards.

The OBLIQUUS CAPITIS INFERIOR arises from the side of the spinous process of the vertebra dentata, and is inserted into the back part of the transverse process of the first vertebra of the neck.

It rotates the first vertebra on the second.

The INTERSPINALES are small, short muscles, placed between the spinous processes of contiguous vertebræ. In the neck they are double, in consequence of its spinous processes being bifurcated; in the back, they are almost entirely tendinous; in the loins, they are single and well marked.

They draw the spinous processes together, and keep the spine erect.

Fig. 114.

INTERSPINALES LUMBORUM MUSCLES.

The INTER-TRANSVERSALII are also short muscles, placed in a similar manner between the transverse processes of the vertebræ. In the neck they are double; in the back they are small, tendinous, and not well marked; and in the loins they are single and readily seen.

They draw the transverse processes together, and will of course bend the spine to one side.

The LEVATORES COSTARUM are small muscles concealed by the sacro-lumbalis and longissimus dorsi, and pass from the transverse processes of the last cervical, and the eleven superior dorsal vertebræ, to the upper edges of the next ribs. They are twelve on either side of the spine, and are tendinous in their origins and insertions, with intermediate muscular bellies.

The upper ones are small and thin, and they increase in magnitude as they descend. From the inferior edge of nearly all these muscles a fleshy slip is detached, which passes over the rib next below its origin, to the second rib below, and occasionally to the third. These slips are called Levatores Costarum Longiores. The others, which

Fig. 115.

1. Transverse spinales, or Multifidus Spinæ.
2. Levatores Costarum.

descend from the transverse process to the rib next below, are called Levatores Costarum Breviores.

These muscles are parallel in their obliquity with the external intercostals, and are not very obviously separated from them. They perform the same service, that of elevating the ribs.

The Rotatores Dorsi, of Professor Theile of Bern, pass from the transverse process of a vertebra below to the under margin of the arch of the vertebra above. They are eleven in number on each side, beginning at the second dorsal vertebra and ending at the twelfth. It may be considered as questionable, whether any advantage will arise to descriptive anatomy, by thus separating from the Multifidus Spinæ, fasciculi heretofore considered a part of it, but which Professor Theile says are marked off by a layer of cellular tissue. As much may be said at least of all the numerous strips making up the multifidus spinæ.

SECTION I.

OF THE SPINAL MARROW.

[After thus removing the entire muscles of the back, the spinous processes of the vertebræ should be cut through either by the saw, or chisel and mallet, when the student may readily undertake the study of the spinal marrow as it lies in the vertebral canal.

If the chloride of zinc has been injected to preserve the subject, the spinal marrow will be found considerably hardened, and thus improved for study. But if the chloride has not been used, it will probably be too soft for a satisfactory investigation, and it will then be necessary to reserve its examination for another opportunity.]

§ 1. THE MEDULLA SPINALIS.

The Spinal Marrow (Medulla Spinalis) is placed in the vertebral canal, and starting from the first vertebra of the neck, passes down as far as the first or second vertebra of the loins; and there terminates in a conical point.

It has the same number of membranes with the Brain; to wit, the Dura Mater, Tunica Arachnoidea, and Pia Mater.

The Dura Mater resembles very much the same membrane of the brain, except that it has more elasticity. It does not adhere closely to the spinal canal, but lies loosely enveloping the spinal marrow and nerves, until it touches the foramina through which the latter pass out. Between the spinal canal and the dura mater is interposed a soft, watery, and vascular fat, which forms a sort of bed for the dura mater, and fills up many of the inequalities of the canal. At the egress of the dura mater from the cranium, just around the foramen magnum, it adheres very closely to it and also to the first cervical vertebra.

The Pia Mater is in close union with the Medulla Spinalis, and is commonly found with its veins injected after the same manner with the pia mater of the brain; it is, however, not so vascular, and ends by a conical cord below, which goes to the lower end of the sacrum, with the dura mater.

The Tunica Arachnoidea lies loosely between the dura and the pia mater, preserving a character of extreme tenuity and transparency; it may be elevated anywhere with a pair of forceps; continues downwards to the end of the spinal cavity, and connects the fasciculi of nerves together.

On each side of the spinal marrow, running between the anterior and posterior fasciculi of nerves, is a narrow semi-transparent band, called the Ligamentum Denticulatum, fixed beneath the tunica arachnoidea, and connected to the pia mater by its internal margin. It is first observed arising at the occipital foramen; it then descends, and, as it passes between the anterior and posterior fasciculi of nerves, it detaches many little round tooth-like processes, fixed to the inner surface of the dura mater, and carrying the tunica arachnoidea along with them. From these processes it derives its name.

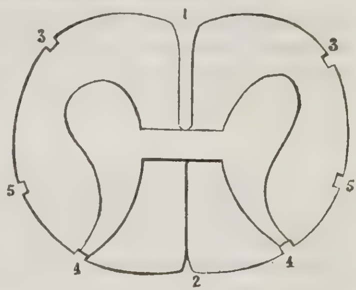
The Medulla Spinalis, like the brain, consists of two kinds of matter, cineritious and medullary. But the latter is here placed externally.

The medulla spinalis has, anteriorly and posteriorly, a fissure penetrating almost to its centre, and extending its

Fig. 116.

Fissures or Sulci of the Spinal Marrow.

1. Anterior Longitudinal Fissure.
2. Posterior Longitudinal Fissure.
3. Antero-Lateral Fissure, for the Corresponding Roots of the Spinal Nerves.
4. Postero-Lateral Fissure, for the Posterior Roots of the Spinal Nerves.
5. Lateral Fissure.



whole length, which divides it into two equal parts. These halves are each again divided into an anterior and posterior column, by a lateral fissure, which is not so deep or long as the other, but terminates in the thoracic portion of the canal, and is nearer the posterior than the anterior fissure. The posterior column is again divided into two. These several divisions of the spinal marrow being connected by the internal cineritious matter, when a horizontal cut is made, the latter puts on the appearance of a line with a crescent at each end. At the upper end of the medulla spinalis, near the oblongata, a considerable part of the anterior portions or columns crosses from the side to which they belong to the opposite one, and in doing so they are interwoven. This decussation or crossing is known as that of Petit or Mitischelli.

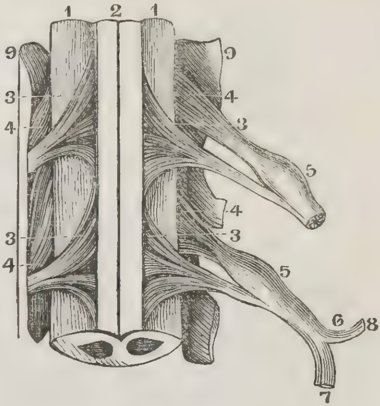
In the bottom of the anterior fissure there is a commissure of transverse fibres, said to be like the teeth of a saw; and at the bottom of the posterior fissure, there is a commissure of longitudinal fibres; these are called anterior and posterior Commissures.

From the anterior and posterior portions of the spinal marrow, flat fasciculi of nerves proceed by double roots which penetrate the dura mater separately, and derive a coat from it. This coat exists for some distance as a sheath, united to the nerve by loose cellular substance, but is closely fixed to it near the intervertebral foramen. The posterior fasciculus, at this place, forms a ganglion, which sends out a nerve at its fore part; this nerve, just at its origin, is united to the anterior fasciculus, and thus forms the commencement of the spinal nerve. As soon as the spinal nerve clears the foramen between the bones, it sends branches backwards to the muscles of the spine, others forward to join the sympathetic, and the middle trunk goes according to the part of the body to be supplied.

There are thirty pairs of Spinal Nerves; seven to the neck, twelve to the back, five to the loins, five to the sacrum, and one which passes between the occiput and first vertebra, called Sub-Occipital. The nerves of the neck, from their origin to the intervertebral foramina, are short and nearly horizontal; those of the back pass obliquely downwards, increasing in obliquity as they descend. The lumbar and sacral nerves are extremely oblique, the lowest being almost vertical; they arise

Fig. 117.
ORIGIN OF THE SPINAL NERVES.

1, 1. Lateral Columns, marked off in front at (2) the Anterior Fissure.
3. Anterior Roots.
4. Posterior Roots.
5. Ganglion formed by the Posterior Roots.
6. Spinal Nerve, formed by the junction of the Anterior and Posterior Roots.
7. Anterior Branch of the Spinal Nerve.
8. Posterior Branch.



very much in a cluster, close to each other, and form, while still within the dura mater, the Cauda Equina.

The Arteries of the Spinal Marrow are derived from the vertebrals, intercostals, lumbar and sacral arteries. The veins accompany the arteries and form sinuses on the outside of the dura mater, one on each side, which empty into the occipital and lateral sinuses, anastomosing, however, very freely with a plexus of veins which surrounds the spinal column.

CHAPTER VIII.

OF THE UPPER EXTREMITIES.

SECTION I.

OF THE SUPERFICIAL VEINS AND NERVES.

[BEFORE commencing the study of the deeper portions of the upper extremities, the student should make himself acquainted with several points connected with the superficial anatomy of these limbs, and especially of the parts concerned in bleeding. With this view, the veins of the arm should be distended, by throwing into them a colored injection, such as Plaster of Paris, water, and indigo, a small pipe being introduced into one or more of the veins easily found on the back of the wrist or hand, and the injection arrested above by a firm ligature tied near the axilla. The veins being thus filled, an incision should next be made through the skin alone, commencing above the insertion of the Pectoralis Major muscle, and extending it along the middle of the biceps muscle to about three inches below the bend of the elbow. At this point make a second or a transverse cut which shall extend from the radial to the ulnar border of the forearm. After dissecting off the skin, and noticing how the veins are imbedded in the adeps of the part, a similar incision may be cautiously carried through the fat and superficial fascia, the flap being turned inward and outward with great care. If this be properly done the following parts will be exhibited, in the order assigned them by Mr. Wilson:—

The Internal Cutaneous Nerve.
" Intercosto-Humeral Nerve.
" Nerve of Wrisberg.
" External Cutaneous Nerve.

The Spiral Cutaneous Nerve.
" Cephalic Vein.
" Basilic Vein.
" Posterior or Ulnar Branch of Basilic Vein.
" Anterior or Ulnar Branch of same Vein.
" Radial Vein.
" Median Vein.
" Median Cephalic, and
" Median Basilic Veins.

Each of which should be well noted.

§ 1. SUPERFICIAL NERVES OF THE UPPER EXTREMITY.

The INTERNAL CUTANEOUS NERVE is the most internal as well as the smallest branch of the Axillary Plexus of Nerves. It pierces the fascia immediately below the axilla, and, running down the inner side of the arm to the bend of the elbow, divides into several branches, which pass in front or overlay the median basilic vein, and are afterwards distributed to the integument on the inner side of the forearm, as far down as the hand. Some of its filaments communicate with the external cutaneous nerve.

The INTERCOSTO-HUMERAL CUTANEOUS NERVES are the branches of the external first, second, and third intercostal nerves. Piercing the intercostal muscles, they supply the parts in the axilla, as well as the integument on the inner side of the arm.*

The NERVE OF WRISBERG is a small branch which is detached from the inner cord of the brachial plexus. As it passes down, it communicates with the second intercosto-humeral nerve. It supplies the integument of the lower half of the upper arm on its inner and posterior aspect.

The EXTERNAL CUTANEOUS NERVE pierces the deep fascia just above the elbow, where it emerges from be-

* Wilson's Dissector, American edition, 1851.

neath the tendon of the biceps muscle. Passing behind the median cephalic vein, it goes to supply (by several branches) the integument on the outer side of the forearm.

The SPIRAL CUTANEOUS NERVE is a branch of the musculo-spiral. It escapes from the deep fascia just below the insertion of the deltoid muscle, and, continuing its course down the outer or radial border of the forearm, is likewise distributed to the integument.

§ 2. SUPERFICIAL VEINS OF THE ARM.

The CEPHALIC VEIN is that which is seen on the outer or radial side of the arm, until it reaches a point somewhat above the insertion of the deltoid muscle, where it enters a fissure between the deltoid and the pectoralis major, and continuing up the latter muscle empties into the subclavian vein. While in this muscular fissure, the vein is in close relation with a small trunk, a branch of the thoracico-acromialis artery.

The BASILIC VEIN passes up along the inner or ulnar side of the arm for a short distance above the elbow, when it penetrates the deep fascia, and, getting into close connection with the brachial artery (as will be seen in a future dissection), it becomes the Brachial vein.

The blood from the inner side of the hand and forearm is returned by two veins, sometimes called the *anterior* and the *posterior* Ulnar veins, which are the radicles of the basilic vein. The latter commences by a small trunk on the little finger, called the Vena Salvatella, and keeping on the ulnar border of the forearm, the veins ascend, one anteriorly and the other posteriorly, till they arrive near the bend of the arm, when they unite to form the single trunk, which is the basilic.

The MEDIAN VEIN, so called from its position on the middle of the forearm, carries the blood from the middle of the hand and forearm. As it approaches the elbow, this vein presents a pretty large trunk, which is augmented by a branch called the *communicating branch*,

Fig. 118.
SUPERFICIAL VEINS OF THE SUPERIOR EXTREMITY.

a. Commencement of Cephalic Vein.
b. Main Trunk of Cephalic Vein.
c. Anterior Branch of Basilic Vein.
d. Posterior Branch of Basilic Vein.
e. Basilic Vein.
f. Median Vein.
g. Median Basilic Vein.
h. Median Cephalic Vein.
i. Biceps Muscle.

because it connects with the deep veins of the arm, after which it divides into two branches by an arrangement which resembles the letter Y. One (the outer one) going to join the cephalic vein, is hence called the MEDIAN CEPHALIC, while the other (the inner one), going to join the basilic vein, is called the MEDIAN BASILIC vein. The latter overlays the brachial artery, and is separated from it only by the deep fascia

The RADIAL VEIN receives the blood from the back of the hand, and passing up the outer side of the forearm at the bend of the elbow, is joined by the median cephalic vein, and continues up the arm as the *cephalic vein.*

As the practical application of this description is principally in connection with the subject of bloodletting, the student should carefully notice the following points: 1. That the internal cutaneous nerve overlays the median basilic vein; 2. That the vein itself overlays the brachial artery; and 3. That from the above relations this vein should not be selected for venesection, the median cephalic, from its position and relations, being that best adapted for the safe performance of this operation.—A.]

SECTION II.

OF THE FASCIA.

The muscles of each upper extremity are invested by an aponeurotic membrane, called the FASCIA BRACHIALIS, which extends from the shoulder to the hand. It begins at the base and spine of the scapula, the margin of the acromion process, the acromial extremity of the clavicle, and from the cellular membrane in the armpit, and extends itself over all the muscles of the dorsum of the scapula, and over the deltoid muscle. The tendons of the latissimus dorsi and pectoralis major, each send off from their margins an expansion which is lost in it. Below the spine of the scapula, it is strong and well marked; but on the deltoid muscle, as well as on the muscles of the arm, its desmoid character is by no means so well developed. Above the condyles of the humerus, the Fascia Brachialis sends down to the bone a strong, tendinous partition to each ridge, and which runs the length of the latter, from its upper end to the condyle. These processes separate the muscles on the back of the arm from such as are on the front of it, and are sometimes called the Ligamentum Inter-Musculare Internum and Externum. They afford origin to the many muscular fibres. At the bend of the elbow, the fascia brachialis is joined by a fasciculus of tendinous matter, from the ulnar margin of the tendon of the biceps flexor cubiti, and which, in the contraction of the muscle, will keep the fascia tense. At the lower extremity of the forearm, the transverse fibres, after diminishing sensibly, become more numerous, and by their attachments to the several ridges on the back of the radius and of the ulna, form the Ligamentum Carpi Dorsale. This ligament is extended from the styloid or outer margin of the radius, transversely to the styloid or inner margin of the ulna, to the pisiform bone, and to the fifth metacarpal.

The Fascia Brachialis affords origin in part to the muscles on the dorsum of the scapula below its spine. On the arm it is not so intimately connected with the muscles, but on the forearm they again begin to arise in part from it. In its whole course partitions constituting the sheaths of the muscles, and which consist, for the most part, of common cellular and adipose membrane, go from it down to the periosteum and interosseus ligament. It adheres very tightly to the ulna, from the olecranon to the styloid process, and on its cutaneous surface are found all the superficial veins, nerves, and lymphatics of the arm.

It is unnecessary to undertake, from the first, a regular dissection of this fascia, inasmuch as it will be gradually exposed in proceeding with the muscles.

The Upper Extremity may be most conveniently studied, after the back has been dissected, by detaching it from the trunk, taking care to leave the clavicle attached to the scapula. If removed before this, some of the muscles of the back will be destroyed.

SECTION III.

OF THE MUSCLES OF THE SHOULDER.

The Muscles situated on the shoulder are six in number; they extend, for the most part, from the scapula to the head and neck of the os humeri.

1. The Deltoid is situated just beneath the skin, and forms the cushion, which protects and gives rotundity to

the shoulder-joint. It arises from the inferior edge of the whole spine of the scapula, from the circumference of the acromion process, and from the exterior third of the clavicle. Its origin, for the most part, is tendinous and fleshy mixed; but at its posterior part it is entirely tendinous.

It is inserted by a tendinous point into the triangular rough surface on the outer side of the os humeri, near its middle. Its general configuration is triangular, and, when spread out, its upper margin being opposed to the insertion of the trapezius, is much more extensive than one would suppose. Its fibres do not converge regularly to its insertion, like the radii of a circle; but the whole muscle is divided into several parts, between which, the interposition of intermuscular tendons affects the course of the fibres, makes several portions of the deltoid look penniform, and others like smaller deltoids introduced into the larger.

Fig. 119.

A View of the Deltoid Muscle.

1. Body of the Muscle.
2. Its Insertion into the Clavicle.
3. Its Insertion into the Spine of the Scapula.
4. Its Insertion into the Humerus.

The deltoid covers the insertion of the pectoralis major, latissimus dorsi, and teres major, besides that of the other muscles of the shoulder. It also conceals the origin of the biceps flexor cubiti, and of the coraco-brachialis. Its insertion is between the triceps extensor and the biceps flexor, and above the origin of the brachialis internus.

It raises the os humeri to a horizontal line with the acromion.

Between the superior edge of the deltoid, the acromion process, and the subjacent tendons on the top of the articulation, there is a large Bursa Mucosa, which is sometimes partitioned off into two.

The deltoid should now be detached from its origin and thrown down, in which a good view of the other muscles will be obtained.

2. The SUPRA-SPINATUS SCAPULÆ arises fleshy from the whole fossa supra-spinata, which it fills up, and from its margins. It terminates in a thick robust tendon, closely connected with the capsular ligament of the joint, and which, passing under the jugum formed by the articulation of the acromion with the clavicle, is inserted, tendinously, into the inner face of the great tuberosity of the os humeri. It raises the arm, and turn it outwards.

Fig. 120.

MUSCLES OF THE SCAPULA.

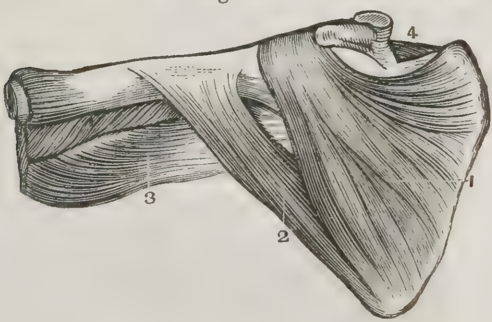
1. Supra Spinatus.
2. Infra-Spinatus.
3. Teres Minor.
4. Teres Major.

3. The INFRA-SPINATUS SCAPULÆ arises fleshy from all that portion of the dorsum scapulæ below its spine, from the spine as far as the cervix, and from the several margins of the fossa infra-spinata. Its fibres pass obliquely to a middle tendon, which adheres closely to the capsular ligament, and goes under the projection of the acromion. This tendon is inserted into the middle facet of the greater tuberosity of the os humeri.

The infra-spinatus rolls the os humeri outwards and backwards. There is a bursa between its tendon and the scapula.

4. The TERES MINOR is situated at the inferior margin of the infra-spinatus, in the fossa of the inferior costa scapulæ, and looks very much like a part of the infra-spinatus, to which it occasionally adheres so closely as to

Fig. 121.



MUSCLES OF THE SCAPULA.

1. Sub-Scapularis.
2. Teres Major.
3. Part of Triceps.
4. Deltoid Muscle.

be separated with difficulty. It arises fleshy from the whole of the fossa, and from the margins of the inferior costa, in the space from the cervix of the bone to within an inch or so of its inferior angle.

It is inserted tendinous and fleshy into the outer facet of the great tuberosity of the os humeri, just below the infra-spinatus.

It draws the os humeri downwards and backwards, and rotates it outwards.

5. The Teres Major is situated at the inferior edge of the teres minor. It arises fleshy from the posterior surface of the angle of the scapula, and from a small part of its inferior costa; the interstice between it and the teres minor is considerable.

It is inserted by a broad tendon into the internal ridge of the groove of the os humeri, along with the tendon of the latissimus dorsi. Their tendons at first are closely united, but afterwards there is an intermediate cavity lubricated with synovia. The tendon of the latissimus dorsi is anterior, and the lower edge of the teres extends farther down the arm than that of the other.

It rolls the os humeri inwards, and draws it downwards and backwards.

6. The Subscapularis occupies all the thoracic surface of the scapula, being between it and the serratus major anticus. It arises fleshy from the whole base, superior and inferior costa, and costal surface of the scapula; it is divided into several columns, which look somewhat like distinct muscles, but which all terminate in a thick robust tendon, that adheres to the inferior surface of the capsular ligament.

This tendon is inserted into the lesser tuberosity of the os humeri. The subscapularis rolls the bone inwards and draws it downwards. Between it and the neck of the scapula there is a bursa, which, as mentioned, communicates with the articulation.

SECTION IV.

OF THE MUSCLES OF THE ARM.

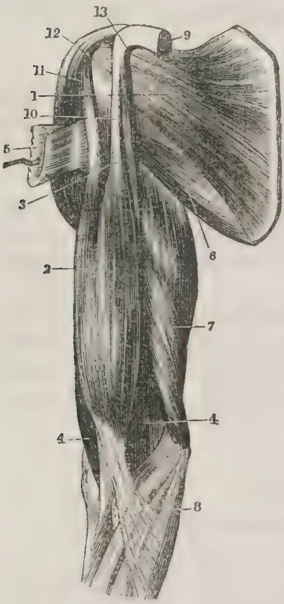
The Muscles of the Arm are five in number, three anterior and two posterior, and should be dissected so as to leave the sheath of the bloodvessels of the arm unopened. (For their description, see next section.)

1. The Biceps Flexor Cubiti is situated immediately

beneath the fascia and integuments, and creates the fulness so obvious in the middle front part of the arm. It arises by two heads. The first, called the long, is a round tendon, which comes from the superior extremity of the glenoid cavity of the scapula, passes through the shoulder-joint, and through the groove of the os humeri; the second or short head arises tendinously from the extremity of the coracoid process of the scapula, in company with the coraco-brachialis muscle. The fleshy bellies in which these tendons terminate unite with each other, a few inches below the shoulder-joint, to form a common muscle.

Fig. 122.

MUSCLES OF THE ANTERIOR BRACHIAL REGION, THE ANTERIOR HALF OF THE DELTOID BEING CUT AWAY.



1. Subscapularis Muscle.
2. Biceps.
3, 6. Teres Major.
4, 4. Brachialis Anticus.
5. Tendon of the Pectoralis Major.
7. Internal Head of the Triceps.
8. Tendinous Expansion of the Biceps.
9. Extremity of the Pectoralis Minor.
10. Coraco-Brachialis.
11. Long Head of the Biceps.
12. Short Head of the Biceps.
13. Coracoid Process of the Scapula.

At first, they are only connected by loose cellular substance, but about half-way down the arm they are inseparably united.

The biceps terminates below in a flattened oval tendon, which passes in front of the elbow-joint, to be inserted into the posterior rough part of the tubercle of the radius. A bursa mucosa is placed between the tendon and the front of the tubercle, the surface of the latter being covered with cartilage. From the ulnar side of this tendon proceeds a fascia, running into that of the forearm.

The relative position of the biceps is as follows. Its long head is first within the cavity of the capsular ligament, and then between the tendons of the latissimus dorsi and pectoralis major, where it is bound down by strong ligamentous fibres. The tendon below is superficial, and may be easily felt by flexing the extremity; but its insertion dips down between the pronator teres and supinator radii longus muscles.

This muscle flexes the forearm.

2. The Coraco-Brachialis is situated on the upper internal side of the arm, at the inner edge of the short head of the biceps muscle, with which it is connected for three or four inches. It arises tendinously and fleshy from the middle facet of the point of the coracoid process of the scapula, in common with the short head of the biceps muscle.

It is inserted, tendinous and fleshy, into the internal side of the middle of the os humeri, by a rough ridge, just below the tendons of the latissimus dorsi and teres major, and in front of the brachialis externus, or third head of the triceps. From the lower end of this muscle there proceeds to the internal condyle of the os humeri an intermuscular ligament, which separates the brachialis internus from the third head of the triceps.

This muscle draws the arm upwards and forwards.

3. The Brachialis Internus is situated immediately beneath the biceps, and is concealed by it, excepting the outer edge. It has a bifurcated fleshy origin, from the middle front face of the os humeri, on each side of the insertion of the deltoid, and its origin is continued fleshy from this point downwards, from the whole front of the

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bone to within a very small distance of its articular surface.

It is inserted by a strong, short tendon into the rough surface at the root of the coronoid process of the ulna. A bursa sometimes exists between the tendon of the brachialis internus, that of the biceps, supinator brevis, and the elbow-joint.

The brachialis flexes the forearm, and, by passing in front of the elbow-joint, strengthens the latter very much. Its lower part lies under the tendon of the biceps, and between the pronator teres and the supinator longus.

4. The TRICEPS EXTENSOR CUBITI forms the whole of the fleshy mass on the back of the arm; it therefore occupies the space between the integuments and the bone. It arises by three heads. The first, called Longus, comes, by a flattened tendon, from a rough ridge on the inferior edge of the cervix scapulæ. The second, called the Brevis, arises, by a sharp, tendinous, and fleshy beginning, from a slight ridge on the outer back part of the os humeri, just below its head. The third head, called Brachialis Externus, arises, by an acute, fleshy beginning, from the inner side of the os humeri, near the insertion of the teres major. This muscle, both at its external and internal edge, is separated from the muscles in the front of the arm, by the intermuscular, ligamentous septum, which arises near the middle of the os humeri, and runs to its condyles. The whole back of the os humeri, as well as the posterior surface of these intermuscular septa, is occupied by the origin of the triceps. The muscular fibres run in various directions according to their respective heads and places of origin.

At the inferior end of the muscle is found a broad tendon, which covers its posterior face. This tendon is inserted into the base or back part of the olecranon, and into the ridge, leading down the ulna on its radial side.

The triceps extends the forearm. Its bellies unite above the middle of the os humeri, but the interstices between them may be observed much lower down.

There is a bursa between the tendon and the olecranon process; besides which, there is sometimes another on each side of the first.

Connected with the last is a muscle which should be dissected at the same time, as it has corresponding functions, and looks very much like an appendage of the triceps; it is the

5. Anconeus. This is a small triangular muscle just beneath the skin, at the outer posterior part of the elbow-joint. It arises tendinous from the posterior lower part of the external condyle of the os humeri, adheres to the capsular ligament of the joint, and is partly covered by the tendon of the triceps.

It is inserted fleshy and thin into the ridge on the outer part of the head of the ulna, leading from the olecranon, and fills up the triangular depression found there.

It extends the forearm.

SECTION V.

OF THE BLOODVESSELS OF THE UPPER EXTREMITIES.

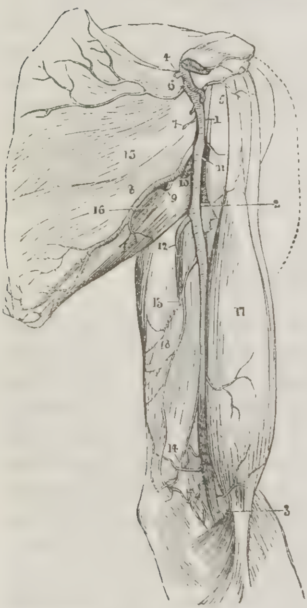
§ 1. OF THE ARTERIES.

The Arteries of the Upper Extremity are derived from the subclavian, the course of which, as far as the scaleni muscles, is described in the account of the neck. The Subclavian passes over the middle of the first rib, between the scalenus-anticus and medius muscles, and afterwards goes between the first rib and the subclavius muscle to the armpit. Here it is called the Axillary Artery (Arteria Axillaris), and its position is under the tendinous insertion of the pectoralis minor, and almost touching it It then passes, at the internal inferior part of the head of the humerus, parallel with and bordering on, the internal edge of the coraco-brachialis muscle. At the posterior fold of the armpit, it is placed very near the tendon of the latissimus dorsi, between it and the coraco-brachialis. Emerging from the axilla at this place, its name is changed into that of Brachial Artery (Arteria Brachialis), and it is closely connected with the nerves of the arm by cellular tissue.

The Arteria Brachialis descends the arm, at the internal margin of the lower part of the coraco-brachialis, and afterwards at the internal margin of the biceps flexor cubiti. At the bend of the arm it is at the inner edge of the tendon of the biceps, and passes under its aponeurosis, and a little below the joint it generally splits into two branches of nearly equal magnitude, the Radial and the Ulnar Artery, although occasionally this division occurs much higher up the arm, as hereafter stated.

Fig. 123.

A View of the Axillary and Brachial Arteries.



1. Axillary Artery, which ends at 2 in the Brachial.
2, 3. Brachial Artery.
4, 5, 6, 7. External Thoracic Arteries.
8. Subscapular Artery.
9. Its Dorsal Branch.
10. Posterior Circumflex.
11. Anterior Circumflex.
12. Profunda Superior.
13. Profunda Inferior vel Minor.
14. Anastomotic Artery.
15. Subscapularis Muscle.
16. Teres Major.
17. Biceps Flexor Cubiti.
18. Triceps.

The relative situation of this great artery with the nerves and veins of the part should be closely observed. Between the scaleni muscles, the majority of the nerves forming afterwards the axillary plexus, is above and somewhat posterior to the subclavian artery; but when the subclavian artery becomes axillary, the nerves unite in various combinations, and surround it like so many cords of a platted whip-thong. The axillary vein is below and somewhat in front of the artery, and very near it. These several parts are united by a loose vascular, adipose, and cellular membrane, containing many lymphatic glands.

1. The ARTERIA DORSALIS SUPERIOR SCAPULÆ varies much in its origin; it comes sometimes from the subclavian, and on other occasions from the upper part of the axillary. Not unfrequently it is a branch of the inferior thyroid. In either the first or the last case its course is very important to the surgeon, for it runs along the posterior margin of the clavicle, towards its acromial extremity, and in an operation, by being opened, might be mistaken for the subclavian artery itself. When it comes from the axillary artery it is tortuous, and has to ascend to its destination, being completely out of the way of an operation from above, upon the subclavian artery. Its final distribution is always the same, for it passes through the notch in the upper costa of the scapula, near the coracoid process, and there divides into branches supplying the supra-spinatus muscle, the infra-spinatus, and the parts contiguous to the shoulder-joint.

2. The ARTERIA MAMMARIÆ EXTERNÆ arise from the axillary between the subclavius and the pectoralis minor muscles. They consist of four principal branches, going uniformly to certain parts; but the origin of these branches varies, for sometimes they are originally distinct trunks from the axillary artery, and on other occasions blended into one or more. They are

a. Thoracica Superior, distributed to the parts of the pectoralis major muscle, just below the clavicle, some branches going to the pectoralis minor.

b. Thoracica Longa, supplying the inferior parts of the great pectoral muscle, the mamma of the female, and the integuments.

c. Thoracica Acromialis, making for the fissure between the deltoid and great pectoral muscle, and distributed to them along the margins of this fissure, upwards and downwards.

d. Thoracica Axillaris, very irregular in origin and size; when small, it is distributed generally to the fat and glands of the axilla; when large, it is a trunk the size of a goose-quill, running on the scapular surface of the serratus major anticus, and distributed to it and adjacent muscles by branches coming off at right angles.

3. The SCAPULARIS (Subscapularis) arises from the axillary artery about the anterior margin of the subscapularis muscle. It passes downwards towards the angle of the scapula, in contact with this muscle, and is distributed to the teres major and minor subscapularis and latissimus dorsi muscles.

A little below the neck of the scapula, a large trunk, the Dorsalis Inferior Scapulæ, arises from the scapularis, and winds around the bone to be distributed to the infraspinatus and the contiguous muscles, an anastomosis being formed under the neck of the acromion process, between the dorsalis inferior and superior scapulæ.

4. The CIRCUMFLEXA ANTERIOR is a small artery about the size of a crow-quill. It arises from the axillary, just above the superior or posterior margin of the tendon of the teres major and latissimus dorsi. It adheres closely to and surrounds half the os humeri, just below its head, going between the bone and the coraco-brachialis and biceps muscles, to be distributed to the articulation and to the contiguous muscles.

5. The CIRCUMFLEXA POSTERIOR is much larger, and arises from the axillary about the same place with the last, but commonly a little below; sometimes they have a common trunk. It surrounds the back part of the os humeri, going between the long head of the triceps and the bone, by passing between the teres minor and major muscles in the first instance. It is distributed to the

shoulder-joint and the contiguous muscles, especially the deltoid.

6. The PROFUNDA MAJOR HUMERI, or SPIRALIS, arises from the great artery of the upper extremity, just below the tendon of the teres major, where the artery is called Brachial or Humeral. It passes downwards a little distance, and there enters the interstice between the first and the third head of the triceps muscle. It winds between this muscle and the bone very obliquely downwards, and appears at last on the outer side of the arm, between the brachialis internus and the supinator longus; it reaches to the external condyle. In this course the profunda sends many branches to the triceps and to the contiguous muscles. Its origin is sometimes from the scapular, or from the posterior circumflex artery.

7. The PROFUNDA MINOR is uncertain in its origin, but comes commonly from the Brachial, two inches below the last; sometimes it is a branch of the last. It is distributed on the internal surface of the triceps extensor, and extends to the internal condyle.

8. The NUTRITIA is a very small branch from the humeral, arising near the medullary foramen of the os humeri, which it penetrates, and is distributed to the lining membrane of the bone. It is not larger than a knitting-needle.

9. The ANASTOMOTICA is a small branch from the humeral, arising about the place where the os humeri begins to expand in order to form the elbow-joint. It passes on the internal face of the brachialis internus muscle, and then over the ridge of the internal condyle, to the groove between the condyle and the olecranon process, where it anastomoses with a recurrent branch of the ulnar artery.

Several arterioles are also sent from the brachial artery to the biceps, brachialis, triceps, and coraco-brachialis muscles, which are too irregular and too small to deserve description.

§ 2. OF THE VEINS OF THE ARM.

The Superficial Veins of the arm have been already described at the commencement of this chapter.

The Deep-seated Veins, called Venæ Satellites or Comites, are found in company with every artery of the upper extremity, there being for the most part one vein to each side of the artery. They anastomose frequently by branches which cross the arteries. At the elbow, the radial, ulnar, and interosseous satellites unite, and form a plexus over the bifurcation of the brachial artery; from which plexus a short large branch goes outwards to join one of the superficial veins.

The trunk, formed by the union of the satellites of the forearm, passes upwards on the inner side of the brachial artery, and receives the small veins from the different muscles. Sometimes it joins the basilic about the middle of the arm; on other occasions it joins it near or in the axilla, from which union results the axillary vein.

The Vena Axillaris receives the veins corresponding with the circumflex, scapular, and thoracic arteries, in their proper succession. It is fixed beneath the artery and very near it, in the same sheath of cellular substance. Under the clavicle it becomes Vena Subclavia; and as such, it passes between the clavicle and the first rib, at the inner side of the subclavian artery. It then leaves the artery to go in front of the scalenus anticus, whereas the artery goes between this muscle and the scalenus medius. After crossing the first rib, it receives the superior dorsal vein of the scapula, the external jugular, and afterwards the internal jugular, besides several small veins from the skin and muscles of the neck. It terminates at the internal margin of the scalenus anticus muscle in the Vena Innominata.

SECTION VI.

OF THE NERVES OF THE UPPER EXTREMITIES.

The BRACHIAL or AXILLARY PLEXUS of nerves is formed by the junction of the four inferior cervical and the first dorsal nerve, and supplies the upper extremity by an appropriation of nearly the whole of their anterior branches, which are of considerable magnitude, especially the three intermediate ones. These nerves come out between the anterior and the middle scalenus muscle, being situated above and posterior to the subclavian artery, at various heights, according to the origin of each nerve respectively. Almost immediately after disengaging themselves from the scaleni muscles, they commence the formation of the plexus, which surrounds the artery and continues with it to the lower part of the axilla. The fourth and fifth cervical nerves unite into a common trunk which splits into two; the seventh cervical and the first dorsal do the same; the sixth cervical also bifurcates. It is under the various combinations of these different primary divisions, that the axillary plexus is formed, from which the different nerves of the upper extremity proceed. This plexus, from its close connection with the great artery, must, of course, go between the subclavius muscle and the first rib, and, in the upper part of the axilla, separate the axillary vein from the artery in some measure. The following branches are given off by the brachial plexus, besides the filaments from its roots to the sympathetic and phrenic in front, already mentioned in the account of the Neck.

1. The NERVUS SCAPULARIS (or Supra-Scapularis) is a small branch coming from the upper part of the plexus, commonly the fourth cervical nerve. It accompanies the arteria dorsalis scapulæ superior, to the notch in the upper costa of the scapula, and is distributed to the muscles on the back of the scapula.

2. The NERVI SUBSCAPULARES of Bichat are about three in number; they come also from the central parts

of the plexus, to be distributed upon the teres major, latissimus dorsi, and subscapularis.

3. The Nervi Thoracici are primarily two or three in number. They arise from the middle of the plexus and are divided into anterior and posterior branches, the former being distributed upon the pectoralis major and minor, the latter upon the serratus major anticus.

4. The Nervus Axillaris, or Circumflexus, comes from the lower part of the brachial plexus. It follows the course of the posterior circumflex artery, winding around the upper part of the os humeri, between the teres minor and major, in order to get to the internal surface of the deltoid muscle, where it terminates. In its passage it also furnishes branches to the subscapularis, the teres major and minor, the infra-spinatus, and to the integuments on the back of the shoulder and arm.

5. The Nervus Cutaneus Internus proceeds from the lower part of the brachial plexus between the median and ulnar nerves, and follows the course of the basilic vein to the elbow or near it. In its descent, it detaches small cutaneous filaments anteriorly to the integuments of the biceps, and posteriorly to those of the triceps. A little above the bend of the elbow, commonly where the median basilic joins the basilic vein, or occasionally some inches higher up, it divides into two terminating branches of nearly equal magnitude. The one next the internal condyle lies in front of the basilic vein, just at its junction with the median basilic, and continues in front and parallel with it for some inches. It is distributed, by many ramifications, to the skin of the ulnar side of the forearm and back of the hand, some of the branches winding around to the back part of the forearm. The other branch of the internal cutaneus passes beneath the median basilic vein about six lines from its junction with the basilic, and is distributed to the integuments on the middle front of the forearm. Before this latter branch reaches the median basilic vein, it sends off a cutaneous

filament, which crosses the median basilic in front, about half-way in the course of this vein.

6. The Nervus Musculo-Cutaneus is somewhat larger than the preceding, and comes from the middle of the brachial plexus. It perforates obliquely the upper part of the coraco-brachialis muscle, to which it dispenses filaments; it then passes between the biceps and brachialis internus muscles, giving also filaments to both of them. Its course being remarkably oblique under the biceps muscle, it makes its appearance superficially, only a little above the elbow-joint, near the external condyle. It then passes superficially between the skin and the supinator radii longus muscle, distributing filaments in its course, and, near the lower part of the radius, divides into two orders of fibres, one of which is distributed on the palmar side of the hand, and the other on the dorsal, but both go to the integuments.

7. The Nervus Radialis, or Musculo-Spiralis, arises from the upper portion of the brachial plexus. It is a large trunk, which winds spirally around the os humeri between the triceps muscle and the bone, entering the fissure between the third and the first head of the triceps. It appears on the outside of the os humeri between the brachialis internus and the triceps muscle, running for some inches in contact with their intermuscular ligament. While beneath the triceps it sends several branches to its heads. There are three principal trunks afterwards to this nerve.

a. The Ramus Superficialis Dorsalis is sent from it, on a line with the point of the deltoid muscle. This branch then goes just below the skin, parallel with and over the external ridge of the os humeri; it of course crosses the origin of the muscles of the external condyle. It continues superficial on the posterior external edge of the supinator radii longus muscle, and terminates in the integuments on the back of the hand.

The continued trunk of the muscular spiral, goes in the interstice between the extensor muscles and the brachialis internus, and at the external condyle divides into the other two branches, from which filaments proceed to the contiguous heads of the muscles.

b. The Ramus Profundus Dorsalis perforates the supinator brevis muscle, and gets beneath the radial extensors to the back of the forearm; it is then distributed in numerous filaments to the muscles on the back of the forearm, some of its branches reaching to the wrist.

c. The Ramus Superficialis Anterior seems to be a continuation of the main trunk of the nerve, and descending at the anterior margin of the supinator radii longus muscle, it joins with the radial artery and continues in its company to a short distance below the middle of the radius. This position gives the whole nerve the name of radial. Here it crosses the bone obliquely, beneath the tendon of the supinator longus, and then divides into a palmar and a dorsal ramuscle; the first being distributed to the muscles and integuments of the thumb, the second terminating, so as to supply the back of the hand, of the thumb, fore, middle, and ring fingers, to their extremities.

8. The Nervus Medianus arises from the brachial plexus, like the other nerves. It descends the arm at the inner edge of the biceps muscle, along the anterior surface of the humeral artery, adhering firmly to it and to the deep-seated veins by the cellular substance. As far as the elbow, it sends off no branch of importance. There it lies at the side of the biceps tendon, crosses the lower part of the brachialis internus, and being beneath the aponeurosis of the biceps, it then perforates the pronator teres, and gets between the flexor sublimis digitorum and the flexor longus pollicis, and enters the palm of the hand under the ligamentum carpi, at the radial edge of the tendons of the flexor sublimis. In the palm, it is situated beneath the aponeurosis and the arcus sublimis.

The Median Nerve dispenses the following branches: At the bend of the arm it furnishes filaments to the heads of the first layer of muscles of the forearm; and a little below it detaches the Nervus Interosseous, which supplies filaments to the flexor longus pollicis and flexor profundus. The interosseous nerve then descends with the interosseous artery, in front of the interosseous ligament, and terminates in the pronator quadratus. Before the median nerve reaches the wrist, it sends a branch which supplies with filaments the muscles and integuments of the ball of the thumb. In the palm of the hand, it divides and subdivides, so as to furnish the two sides of the thumb, of the fore, of the middle, and one side of the ring finger with branches, which reach their extremities along with the digital arteries.

9. The Nervus Ulnaris comes from the lowest section of the brachial plexus. It descends along the internal anterior part of the triceps muscle, in a groove formed between it and the intermuscular ligament, diverging in this course gradually from the median nerve till it reaches the elbow, when it is at its greatest point of separation. At the elbow it is behind the internal condyle, in the groove between it and the olecranon, and separates the two heads of the flexor ulnaris muscle. It then gets to the forearm, between this muscle and the flexor profundus digitorum, and continues between them to within two inches of the wrist-joint, when it detaches the Ramus Dorsalis.

The Ramus Dorsalis slips between the ulna and the tendon of the flexor ulnaris, runs along the internal margin of the ulna to the carpus, when it divides into ramuscles which supply the ulnar side of the integuments on the back of the hand, and the backs of the last two fingers. At the interval between the heads of the metacarpal bones of the middle and ring fingers, a considerable ramuscle joins one from the ramus superficialis anterior of the nervus radialis or musculo-spiralis.

The Ulnar Nerve, having given off this dorsal branch, descends along the radial margin of the tendon of the flexor ulnaris and of the os pisiforme, above the annular ligament, to the palm of the hand. Getting beneath the aponeurosis, it there detaches first a deep-seated branch, which penetrates the muscles of the little finger to supply them, the interossei, and the short flexor of the thumb. The ulnar nerve then furnishes a superficial branch, and afterward divides into three; one for the ulnar side of the little finger, another for the opposing sides of the little and ring finger, and a third which joins the most internal digital branch of the median nerve.

To conclude; the dissector should also attend to what are called the Intercosto-Humeral Nerves. They consist of a branch from the second, and another from the third thoracic, which pass out at the fore and lateral parts of the thorax; the first from beneath the second rib, and the other from beneath the third rib.

The first intercosto-humeral, being connected with a filament from the internal cutaneous, is distributed upon the axillary glands, and the integuments of the axilla and inner side of the arm. The second, being joined by filaments from the first, is chiefly distributed to the integuments on the back of the arm, some of its branches reaching the elbow. The numbness of the inner side of the arm, in angina pectoris, is supposed to be owing to the sympathy of these nerves with the cardiac.

SECTION VII.

OF THE MUSCLES OF THE FOREARM.

There are eight muscles on the front of the Forearm, which arise from the inner condyle of the os humeri, and from the ridge leading to it, and are either directly or indirectly Flexors of the forearm and hand. This fact should be impressed on the mind of the student, as it simplifies much the act of committing them to memory. The systematic treatises of anatomy describe the origin of each muscle as if it were totally distinct from the rest; the student will soon correct the error arising from this, and learn that the heads of all these muscles are connected to contiguous heads, by adhesion and by intermuscular ligaments, and that there would be almost as much propriety in describing them as having a common origin, as there is in considering them so insulated.

Of the eight muscles situated on the front of the forearm, some are superficial and others deep-seated.

1. The Pronator Radii Teres is just beneath the fascia of the forearm, and forms the radial side of the muscles of the internal condyle. It arises fleshy from the anterior face of the internal condyle of the os humeri,

Fig. 124.

A Front View of some of the Muscles of the Forearm.

1. Pronator Radii Teres.
2. Pronator Quadratus.
3. Supinator Radii Brevis.

and tendinous from the coronoid process of the ulna. It passes very obliquely across the forearm at the internal edge of the brachialis internus muscle, and is

Inserted, tendinously and fleshy, into the external back part of the radius just below the insertion of the supinator radii brevis, occupying thereby about two inches of the middle of the bone.

It rolls the hand inwards.

2. The FLEXOR MANUS VEL CARPI RADIALIS is placed at the ulnar side of the last muscle, and is also superficial. It arises by a narrow tendon, from the lower front part of the internal condyle of the os humeri; fleshy from the intermuscular ligaments, the brachial fascia, and the upper part of the ulna. It forms a thick, fleshy belly, terminating below in a tendon, which passes under the anterior annular ligament of the wrist, and runs through a groove in the os trapezium.

It is inserted, tendinously, into the base of the metacarpal bone of the forefinger, in front; and there is a bursa between the lower extremity of its tendon and the trapezium. The tendon is there held down by ligamentous fibres.

It bends the hand and draws it towards the radius.

3. The PALMARIS LONGUS is at the ulnar side of the flexor carpi radialis, and is superficial. Sometimes it does not exist. It is a small, short muscle, terminating in a long, slender tendon, and arises by a small tendon from the internal condyle, and fleshy from the intermuscular ligament on each of its sides.

It is inserted, tendinous, into the upper margin of the ligamentum carpi annulare anterius, near the root of the thumb, and a division of its tendon passes on to the aponeurosis palmaris.

It bends the hand, and makes tense the palmar aponeurosis.

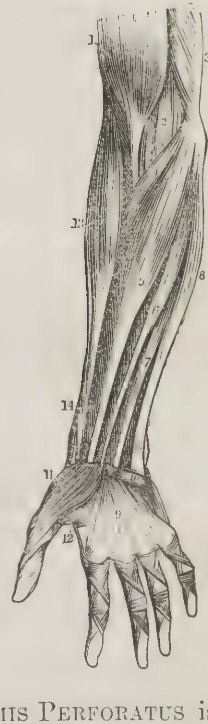
4. The FLEXOR MANUS VEL CARPI ULNARIS occupies among the superficial muscles the ulnar side of the forearm. It arises tendinously from the internal condyle of the os humeri; fleshy from the upper internal side of the olecranon, and by a tendinous expansion which is part of the fascia of the forearm, from the ridge at the internal side of the ulna to within three or four inches of the wrist.

It is inserted into the upper side of the os pisiforme by a round tendon, which begins high up at the radial margin of the muscle, and into which the muscular fibres run. Sometimes the tendon is continued over the os pisiforme, so as to be likewise inserted into the base of the metacarpal bone of the little finger. There is a loose bursa at the junction of the tendon with the pisiforme bone.

It bends the hand and draws it towards the ulna.

Fig. 125.

THE MUSCLES OF THE FRONT OF THE FOREARM.



1. Lower part of the Biceps.
2. Part of the Brachialis Internus.
3. Edge of the Triceps.
4. Pronator Radii Teres.
5. Flexor Carpi Radialis.
6. Palmaris Longus.
7. One of the Divisions of the Flexor Sublimis Digitorum.
8. Flexor Carpi Ulnaris.
9. Palmar Fascia.
10. Palmar Brevis Muscle.
11. Abductor Pollicis Manus.
12. Portion of the Flexor Brevis Pollicis Manus.
13. Supinator Radii Longus.
14. Extensor Ossis Metacarpi Pollicis curving around the lower Border of the Forearm.

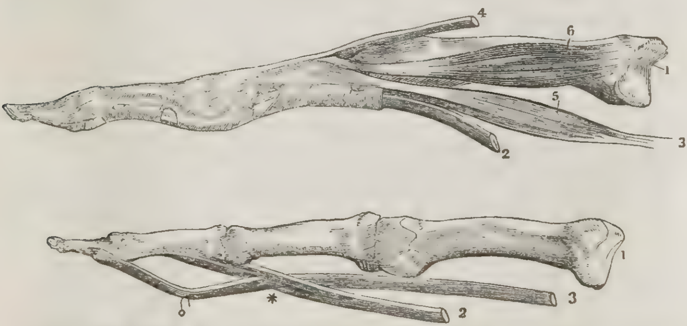
5. The FLEXOR DIGITORUM SUBLIMIS PERFORATUS is concealed very much by the muscles just enumerated in consequence of being placed between them. To get a

good view of its origin, they should all be cut away from the os humeri. It arises, tendinously and fleshy, from the internal condyle of the os humeri; tendinously from the coronoid process of the ulna, and fleshy from the tubercle of the radius; the latter part of its origin being extended, tendinously and obliquely, for three or four inches along that line of the radius which is at the insertion of the pronator teres. With these origins, the muscle spreads over the front of the forearm at its upper part, from the radial to the ulnar margin.

From the lower end of the muscle arise four distinct tendons, which commence much above the wrist, go beneath its anterior ligament, and, having reached the palm of the hand, diverge to the several fingers. To each finger a tendon is appropriated, which passes in front of the metacarpal bone to the phalanges, and, after having split into two, is inserted into the angle formed by the

Fig. 126.

THE METACARPAL AND PHALANGEAL BONES OF THE FINGERS, WITH THE TENDONS ATTACHED.



In the first figure, the tendons of the flexor muscles are bound to the finger by the Vaginal Ligaments. In the second, they are freed from that structure, as well as from the synovial membrane by which it is lined.

1. Metacarpal Bone.
2. Tendon of the Flexor Digitorum Sublimis Perforatus Muscle.
3. Tendon of the Flexor Profundus Perforans.
* The perforation of the former by the latter.
4. Tendon of the Extensor Communis Muscle.
5. One of the Lumbricoides Muscles.
6. An Interosseous Muscle.

junction of the cylindrical and flat surfaces of the second phalanx, near the middle.

It bends the second phalanges on the first; its action may also be continued, so as to clench the hand and to bend it on the arm.

6. The FLEXOR DIGITORUM PROFUNDUS PERFORANS is beneath the flexor sublimis and the flexor ulnaris. It arises fleshy from the oblong concavity of the ulna, between the coronoid and the olecranon processes; fleshy from the lower margin of the base of the coronoid process; from the ulnar portion of the interosseous ligament; and from the front of the upper two-thirds of the ulna.

The tendons of this muscle are different from those of the other; they commence in front of it, like a tendinous membrane, which is gradually divided into several fasciculi, adhering to each other by cellular membrane. The fasciculated character of the tendons is still preserved when they go under the anterior carpal ligament, and until they begin to disperse as distinct tendons to each of the fingers.

Each tendon, going in front of its metacarpal bone and of the corresponding phalanges, gets through the slit in the flexor sublimis, and is inserted into the front part of the base of the third phalanx of the finger.

It bends the last joint of the fingers, and by increased action may flex the hand like the preceding muscle.

7. The FLEXOR LONGUS POLLICIS lies in front of the radius, but beneath the flexor sublimis. It arises, by an acute fleshy beginning, from the radius just below its tubercle; also, fleshy, from the middle two-thirds of the front of the bone, and from the radial portion of the interosseous ligament. The body of the muscle is joined by a small fleshy slip, having a tendinous origin from the internal condyle of the os humeri.

On the ulnar margin of this muscle a tendon is formed early, to which the fibres pass obliquely. This tendon goes under the annular ligament of the wrist, through the fossa formed in the short flexor muscle of the thumb, and between the sesamoid bones, to be inserted into the base of the second phalanx of the thumb. From the inferior end of the forearm to the middle of the first phalanx, the tendon is invested by its appropriate bursa.

It bends the last joint of the thumb.

While performing this dissection, there are several minutiæ which deserve attention. The ANNULAR LIGAMENT of the wrist, in front, is a very strong membrane passing across the carpus, from the projection of the scaphoides and trapezium on the radial side of the wrist, to the unciform process on the ulnar side, and to the cuneiform and pisiform bones. Between it and the concavity of the carpus, an oval foramen is formed for transmitting the tendons of the several flexors.

These tendons, as they pass under the anterior annular ligament of the wrist, are surrounded by the superior Bursa Mucosa. It begins about an inch and a half above the radio-carpal articulation, and extends to the lower margin of the annular ligament. It adheres by its circumference to this ligament, and to the capsule of the joint; within, it sends in a considerable number of processes, whereby each tendon is surrounded and connected to the adjoining tendons; while, at the same time, no restraint is put upon the natural motions of the part. In its texture this bursa resembles a dense elastic cellular membrane. In addition to this, the flexor tendons, as they pass from the root to the extremity of each finger, are surrounded by a synovial bursa, which by its secretion continually lubricates them, and permits them to play freely backwards and forwards, according to the flexions and extensions of the fingers. These mucous or synovial sheaths, begin a little distance above the first joint of the finger, adhere there to both flexor tendons, and extend to about the middle of the last phalanx. They give to the tendons a very polished, lubricated surface; are reflected over the anterior flat faces of the phalanges, being separated from them by a small quantity of adipose matter; are also reflected over the anterior faces of the capsular ligaments, and line the vaginal ligaments.

The VAGINAL LIGAMENTS of the fingers (Ligamenta Vaginalia) bind down the flexor tendons, and keep them applied to the fronts of the phalanges. They are of the same extent from above downwards with the mucous sheaths just mentioned, and are stretched between the ulnar and the radial margins of the phalanges. The fibres of which they consist pass for the most part transversely, and are of a fibro-cartilaginous character. These fibres diminish in number towards the end of each finger, and are stronger on the forefinger than on any of the others. In front of the first joints or meta-carpo-phalangeal articulations and the phalangeal articulations, the vaginal ligaments are much thinner than elsewhere, in order to permit the free flexion of the fingers. The structure indeed, at these points, is decidedly marked off by its diminished thickness; and though the course of the fibres is the same from side to side, yet some anatomists have thought it worth while to designate it particularly under the name of Annuli Juncturarum Ligamentosi.

Within the Vaginal Ligaments small tendinous fræna arise from the first and second phalanges; they vary in number in different individuals, run obliquely forwards, some to terminate in the flexor profundus tendons, and others in those of the flexor sublimis, and are called Vincula Accessoria. They are covered by a reflection of the synovial sheath, and, indeed, seem to be formed almost entirely from the latter.

We may also observe that in front of each joint, independently of the swelling of the articular extremities of the bones, the capsular ligament is thickened by an addition of cartilaginous matter, by which a trochlea is formed. This trochlea facilitates the sliding of the tendons by its smoothness, and the flexions of the phalanges by removing the tendons farther from the axis of motion, after the same manner as the patella.

8. The Pronator Quadratus is just above the carpal surfaces of the radius and ulna, and between the other muscles and the bone. In the adult it is about two inches wide, and its fibres run across the forearm. It

arises, fleshy and tendinous, from the ridge at the inner surface of the ulna near its lower extremity, and from the front of the bone.

It is inserted into the corresponding front surface of the radius.

It rotates the radius inwards.

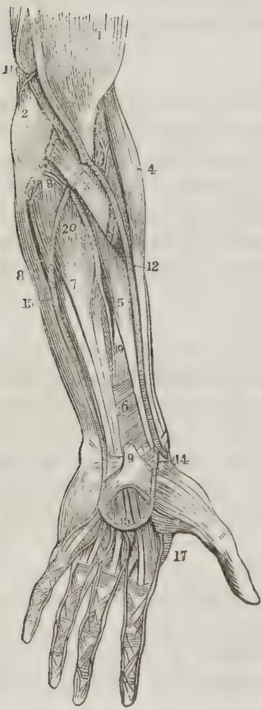
§ 1. ARTERIES OF THE FOREARM AND HAND.

The arteries found in this portion of the dissection are as follows:—

The BRACHIAL ARTERY, as has been stated, is divided a little below the elbow-joint into two principal trunks, the

Fig. 127.

A VIEW OF THE ARTERIES OF THE FOREARM.



1. The Lower Part of the Biceps Muscle.
2. The Inner Condyle of the Humerus, with the Humeral Origin of the Pronator Radii Teres and Flexor Carpi Radialis Muscles cut across.
3. The deep portion of the Pronator Teres Muscle.
4. The Supinator Longus Muscle.
5. The Flexor Longus Pollicis.
6. The Pronator Quadratus.
7. The Flexor Digitorum Profundus.
8. The Flexor Carpi Ulnaris.
9. The Anterior Annular Ligament. The figure is placed on the Tendon of the Palmaris Longus Muscle, divided close to its insertion.
10. The Brachial Artery.
11. The Great Anastomotic Artery.
12. The Radial Artery.
13. The Radial Recurrent Artery.
14. The Superficialis Volæ Artery.
15. The Ulnar Artery.
16. Its Superficial Palmar Arch giving Digital Branches to three fingers and a half.
17. The Great Artery of the Thumb (Magna Pollicis).
18. The Posterior Ulnar Recurrent.
19. The Anterior Interosseous Artery.
20. The Posterior Interosseous, as it is passing through the Interosseous ligament.

Radial and Ulnar. Sometimes this division is on a line with the joint; at other times it occurs nearer the insertion of the brachialis muscle. The division, however, does occasionally occur in all the space between the axilla and the elbow-joint, in which case the radial artery sometimes is just beneath the skin at the elbow, and continues uncommonly superficial to the wrist.

The RADIAL ARTERY (Arteria Radialis) is smaller than the ulnar, and extends from the elbow to the hand. In the early part of its course it is at the bottom of the fissure, between the pronator teres and the supinator radii longus; afterwards, it crosses the insertion of the former, runs parallel with and in front of the radius to the wrist, between the tendons of the supinator longus and of the flexor carpi radialis. Below the styloid process it gets between the carpus and the extensors of the thumb, runs a little distance on the radial side of the back of the hand, and then penetrates to the palm between the base of the metacarpal bone of the thumb and of the forefinger. It furnishes the following branches, collateral and terminating.

1. The RECURRENS RADIALIS arises about the neck of the radius. It winds around the joint externally, between the external condyle and the muscles coming from it, and anastomoses with the spiralis or profunda of the brachial artery; being distributed in many collateral branches to the joint and contiguous muscles.

2. Several small and irregular muscular branches arise from the Radial artery in its progress to the wrist; they have no appropriate names.

3. The SUPERFICIALIS VOLÆ arises from the radial about the inferior margin of the pronator quadratus muscle. It passes superficially over the process of the trapezium to the muscles of the ball of the thumb, and one of its terminating branches joins the arcus sublimis. Sometimes the superficialis volæ is the principal branch of the radial.

4. The Dorsalis Carpi arises from the radial at the carpus, runs transversely across the back of the latter, and detaches the posterior interosseous arteries of the back of the hand. They anastomose with branches from the ulnar and interosseous arteries of the forearm.

5. The Magna Pollicis, a terminating branch of the radial, comes from it in the palm of the hand, just at the root of the metacarpal bone of the thumb. It runs beneath the abductor indicis, and at the head of the metacarpal bone divides into two branches, which go along the sides of the thumb to its extremity; where they anastomose and terminate.

6. The Radialis Indicis, arising at the same place with the latter, runs along the metacarpal bone of the forefinger, and along the radial side of the same finger to its extremity.

7. The Palmaris Profunda is the third terminating branch of the radial artery. It arises near the same place with the last two; crosses the hand between the metacarpal bones and the flexor tendons, thus forming the Arcus Profundus, from which branches proceed to the interossei muscles, and which ends on the ulnar side of the palm of the hand, by a branch to the Arcus Superficialis.

The Ulnar Artery (Arteria Ulnaris), one of the forks of the brachial at the elbow, passes more in a line with it than the radial artery does. Being deeply seated, it goes immediately after its origin, under several of the muscles of the internal condyle, and between the flexor sublimis and profundus. Getting from beneath the flexor sublimis, it afterwards runs parallel with the ulna or nearly so, lying on the flexor profundus, between the flexor ulnaris and the ulnar margin of the flexor sublimis, and concealed two-thirds of the way down the forearm, by the overlapping of these muscles. At the thin part of the forearm, commonly called the wrist, it is superficial, and may be felt pulsating in the living body at the radial margin of the tendon of the flexor ulnaris.

The ulnar artery, at the carpus, takes a very different course from the radial, for it passes over the anterior annular ligament of the carpus, just at the radial side of the os pisiforme, to which it is held by a small ligamentous noose, and then proceeds to the palm of the hand. Between the aponeurosis palmaris and the flexor tendons, it forms that curve from the ulnar to the radial side of the hand, called the ARCUS SUBLIMIS. This curve commonly begins a little beyond the anterior margin of the annular ligament, and, presenting its convexity forwards, terminates about the middle of the ball of the thumb, at its inner margin.

The branches sent from the Ulnar Artery are as follows:—

1. The RECURRENS ULNARIS arises from the ulnar about the lower part of the tubercle of the radius, and winding upwards, is distributed in small branches to the muscles of the internal condyle. One of its ramuscles goes between the internal condyle and the olecranon process, to anastomose with the arteria anastomotica of the humeral.

2. The INTEROSSEA arises from the ulna just below the other. It is a large trunk, and proceeds but a little distance, when it divides into two principal branches, called Anterior and Posterior Interosseal arteries.

a. The INTEROSSEA ANTERIOR is much the larger; it runs in contact with the interosseous ligament to the upper margin of the pronator quadratus, giving off in its course branches to the deep-seated muscles of the forearm. Under the pronator it perforates the interosseous ligament, and distributes to the back of the carpus and of the hand, branches, which anastomose with others from the radial and posterior interosseal.

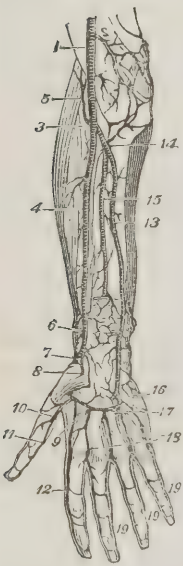
b. The INTEROSSEA POSTERIOR is sometimes a separate trunk, arising from the ulnar just above the former. In either case, it soon perforates the interosseous ligament, to get to the back of the forearm. Here it sends backwards a Recurrent Branch (Recurrens Interossea) to the back of the elbow, which anastomoses with the recurrens ulnaris and radialis. It then proceeds downwards, being deeply seated, and distributed to the different muscles on the back of the forearm. Some of its branches reach the wrist, and anastomose with the carpal arteries.

3. The ulnar artery, in its descent on the forearm, sends off many small and irregular muscular branches, called, by Professor Chaussier, Cubito-Musculaires; they do not require description.

4. The Dorsalis Manus leaves the ulnar at the lower end of the forearm, and passes under the tendon of the

Fig. 128.

Arteries of the Forearm and Hand.



1. Brachial Artery.
2. Profunda Minor.
3. Bifurcation of the Brachial into the Radial and Ulnar.
4. Radial.
5. Recurrens Radialis.
6. Anterior Carpal.
7. Dorsalis Carpi.
8. Superficialis Volæ.
9. Arcus Profundus.
10. Magna Pollicis.
11. Artery of the Thumb.
12. Radialis Indicis.
13. Ulnar Artery.
14. Recurrens Ulnaris.
15. Anterior Interosseal.
16. Cubitalis-manus Profunda, or Anastomosing Artery.
17. Arcus Sublimis.
18. Digital Arteries.

19, 19. Digito-ulnar Arteries.

flexor ulnaris to the back of the hand. It there meets ramuscles of the radial and interosseous, and conjointly they supply, with very small branches, the back of the wrist, of the metacarpus, and of the fingers.

5. As the Arcus Superficialis is about beginning, the ulnar artery sends superficial but small branches to the integuments of the palm. And a little farther on, it gives off a considerable branch, which divides into the bottom of the palm, through the muscles of the little finger, and joins the ulnar extremity of the Arcus Profundus; this is the Cubitalis Manus Profunda of Haller.

6. The Arcus Sublimis then sends a branch to the ulnar side of the little finger. Afterwards in succession, three digital branches are sent off, which arriving at the interstices between the heads of the metacarpal bones, each divides into two branches, to supply the sides of the fingers which are opposite to each other; one branch is called Digito-radial, the other Digito-ulnar, according to the side of the finger on which the artery may be placed.

The Digital Arteries, before they divide, receive each a small branch from the arcus profundus. The digito-radial and ulnar arteries pass along the front sides of the fingers to their extremities, and at the joints and extremities, anastomoses between the arteries of the two sides of the same finger occur.

The Arcus Sublimis terminates on the radial side of the palm by a branch which joins the artery of the thumb, coming from the radial.

The most frequent distribution of the arteries of the hand is what has been just described; anatomists are, however, not at all agreed on this point. It would probably be more just to say that this occurs oftener than any other single arrangement. The variety, in fact, is so great that, before a hand is opened, it is not possible to know in what manner its arteries are distributed. Sometimes the Radial Artery furnishes one-half of the arcus sublimis, and the Ulnar the other half. On other occasions the interosseous artery, or the superficialis volæ, is continued as a large trunk over the ligament of the wrist, and across the root of the thumb, to join the arcus sublimis.

SECTION VIII.

OF THE MUSCLES ON THE BACK OF THE FOREARM.

The muscles on the back of the forearm are ten in number. They arise for the most part from the external condyle and the ridge leading to it, and are Extensors either of the forearm or of the fingers and thumb. Their origins are less blended with each other than those of the flexor muscles; nevertheless, between several of them there are intermuscular ligaments which connect them closely. They are superficial and deep seated.

1. The SUPINATOR RADII LONGUS is situated along the radial edge of the forearm, immediately beneath the integuments. It arises, fleshy and tendinous, from the higher part of the ridge leading to the external condyle, commencing just below the insertion of the deltoid muscle, and being here placed between the brachialis internus and the outer head of the triceps. It forms a thick, fleshy belly, constituting the external margin of the arm about the elbow-joint, and terminates near the middle of the radius in a flat tendon.

It is inserted by the latter into a small rough ridge on the outer side of the radius, just above its styloid process.

It rolls the radius outwards.

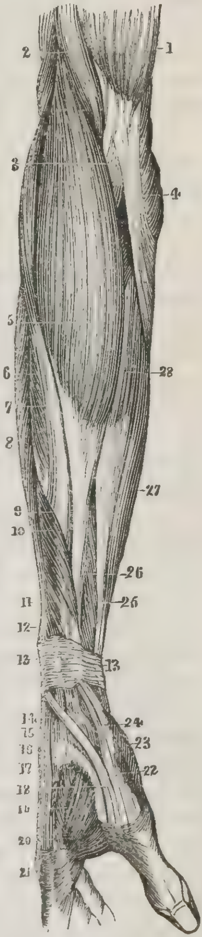
2. The EXTENSOR CARPI RADIALIS LONGIOR is situated beneath the former muscle. It arises, tendinous and fleshy, from the space of the external ridge of the os humeri between the supinator longus and the external condyle. It forms a short, fleshy belly, which terminates in a flat tendon above the middle of the radius.

It is inserted by this tendon into the posterior part of the root of the metacarpal bone of the forefinger near the thumb.

The tendon of this muscle is surrounded by a synovial sheath, at the place where it passes the lower end of the radius, under the posterior carpal ligament. Another bursa also exists at the insertion; which, on one occasion,

Fig. 129.

MUSCLES OF THE RADIAL REGION OF THE FOREARM.



1. Belly of the Biceps Flexor Cubiti.
2. Brachialis Anticus.
3. Tendon of Biceps.
4. Tendinous expansion to fascia.
5. Supinator Radii Longus.
6. Extensor Carpi Radialis Brevior, with its Tendon, 14.
7. Extensor Carpi Radialis Longior, the fleshy belly being above, the tendon below, which latter is inserted at 15.
8. Extensor Digitorum Communis.
9. Tendon of the Supinator Radii Longus.
10. Extensor Ossis Metacarpi Pollicis.
11. Extensor Minor Pollicis, which terminates in a slender tendon, 24.
12. Extensor Major Pollicis, with the terminal portion of its tendon, 18.
13. Posterior Annular Ligament.
16. Tendon of the Indicator.
17. Tendon given off by the Extensor Communis Digitorum to the Index-finger.
18. Tendon of Extensor Major Pollicis.

19, 20. First Dorsal Interosseous Muscle.

21. Its insertion.
22. Abductor of Thumb.
23. Tendon of Extensor Ossis Metacarpi Pollicis.
24. Tendon of Extensor Minor Pollicis.
25. Tendon of the Palmaris Longus.
28. Its fleshy Belly.
26. Flexor Longus Pollicis.
27. Flexor Digitorum Sublimis.

I found so much enlarged in a young woman as to require its extirpation. The operation was fully successful.

It extends the hand.

3. The Extensor Carpi Radialis Brevior is beneath the last, but projects somewhat beyond it. It arises, tendinously, from the posterior and lower part of the external condyle, and from the external lateral ligament of the elbow-joint. It forms a thick, fleshy belly, placed along the radius, and which terminates in a flat tendon about the middle of that bone.

Its tendon, becoming rounded, is inserted into the posterior part of the base of the metacarpal bone of the second finger.

It extends the hand.

4. The Extensor Carpi Ulnaris is superficial, and placed principally parallel with the ulna. It arises, tendinously, from the external condyle, and fleshy, from the intermuscular ligament and inside of the fascia. Crossing very obliquely the upper part of the radius and the ulna, it also arises fleshy from the back part of the latter bone. Its fibres terminate obliquely in a tendon which goes through the groove of the ulna, and is there furnished with a bursa.

It is inserted, by its tendon, into the ulnar side of the base of the metacarpal bone of the little finger.

It extends the hand.

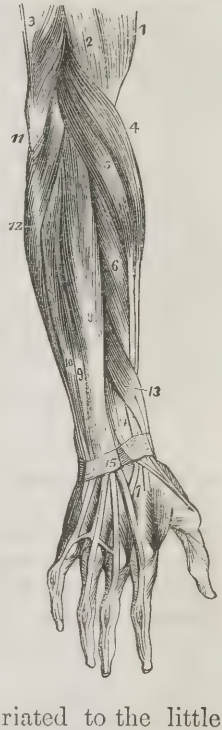
5. The Extensor Digitorum Communis is superficial, being placed between the extensor ulnaris and the extensor radialis brevior. It arises, tendinously, from the external condyle, and fleshy, from the intermuscular ligament of the contiguous muscles. As it approaches the wrist it sends off four tendons, which pass together through a common groove on the back of the radius. On the back of the hand these tendons diverge, and near the roots of the fingers send cross slips to each other.

Each tendon goes to its respective finger, and covers the whole posterior part of it, being spread out into a membrane, which adheres to the phalanges from the root of the first to the root of the last. The precise mode of the insertion of these tendons is as follows: On the back of the first phalanx the lateral margins of these tendons are joined by the tendons of the lumbricales and interossei, and the tendinous membrane thus formed simply adheres by condensed cellular membrane to the whole back of the first phalanx. The middle part of this tendon then passes on to be inserted near the articular margin of the base of the second phalanx, and the two lateral parts of the tendinous membrane, after keeping separate for some distance, unite and are jointly inserted into the back of the base of the third phalanx.

Fig. 130.

THE SUPERFICIAL LAYER OF MUSCLES ON THE BACK OF THE FOREARM.

1. The Lower Part of the Biceps.
2. Part of the Brachialis Internus.
3. The Insertion of the Triceps into the Olecranon.
4. The Supinator Radii Longus.
5. The Extensor Carpi Radialis Longior.
6. The Extensor " " Brevior.
7. The Tendinous Insertion of these two Muscles.
8. The Extensor Communis Digitorum.
9. The Extensor Minimi Digiti.
10. The Extensor Carpi Ulnaris.
11. The Anconeus.
12. Part of the Flexor Carpi Ulnaris.
13. The Extensor Minor Pollicis and the Ossis Metacarpi Pollicis lying together.
14. The Extensor Major Pollicis; its Tendon is seen crossing the Tendons of the two Radio-Carpal Extensors.
15. The Posterior Annular Ligament. The tendons of the extensor communis are seen upon the back of the hand, and also their mode of distribution on the backs of the fingers.



The section of this muscle appropriated to the little finger has a distinct appearance, and frequently its tendon goes through a distinct fossa in the radius, from which causes it has obtained the name of AURICULARIS.

A bursa invests these tendons at the wrist, as they pass through their groove. It is single above, but in following the course of the tendons, like them it divides, and follows each tendon respectively to the base of the first phalanx.

This muscle extends all the joints of the fingers, being the antagonist of the flexors.

6. The SUPINATOR RADII BREVIS can only be well seen by detaching the origins of the aforesaid muscles; it will then be found in contact with the radius, making a close investment of its head and upper third. It arises, tendinous, from the external condyle of the os humeri, and tendinous and fleshy from the ridge which descends from the coronoid process, on the posterior radial edge of the ulna.

Its fibres surround, obliquely, the upper external part of the radius, and are inserted into its tubercle, and into the oblique rough ridge, corresponding with the upper margin of the pronator teres. At the interstice between the radius and ulna, near the anterior edge of this muscle, a fleshy slip is occasionally seen, which passes from the radial side of the coronoid process to the ulnar edge of the radius.

This muscle rotates the radius outwards.

7. The EXTENSOR OSSIS METACARPI POLLICIS MANUS arises fleshy from the posterior part of the ulna immediately below the anconeus, from the interosseous ligament, and from the back part of the radius just below the insertion of the supinator brevis. It terminates in a round tendon, which passes over the tendons of the radial extensors, and through a groove on the styloid side of the lower end of the radius, and is there invested by a bursa.

It is inserted, by its tendon, into the base of the metacarpal bone of the thumb, and into the external side of the trapezium.

It extends the metacarpal bone of the thumb.

8. The EXTENSOR MINOR POLLICIS MANUS is at the ulnar side of the last muscle. It arises, tendinous, from the back of the ulna below its middle, and fleshy from the interosseous ligament. It adheres to the radius, and terminates in a tendon which passes through a groove in the styloid side of the radius along with the last-named muscle.

It is inserted into the first phalanx of the thumb by its tendon, which is extended to the root of the second phalanx.

It extends the first phalanx.

9. The EXTENSOR MAJOR POLLICIS MANUS arises by a small tendinous and extensive fleshy origin, from the back of the ulna above its middle, and from the interosseous ligament; also from the back of the radius; it terminates near the wrist in a tendon, which passes through a groove on the back of the radius near the ulna. The belly of this muscle conceals, very much, the other extensors of the thumb.

It is inserted, by its tendon, into the oblong transverse tubercle on the back of the base of the second phalanx of the thumb. Its tendon is furnished with one synovial sheath at the inferior extremity of the radius, which extends to the carpus; and another which is smaller, and placed upon the carpus and upon the base of the first metacarpal bone.

It extends the second phalanx.

The tendons of the last two muscles are much connected with each other, and are spread in the form of a membrane on the back of the thumb, after the manner of the extensor tendons of the fingers.

10. The INDICATOR is a small muscle on the back of the ulna, concealed by the extensor communis and extensor ulnaris. It arises tendinous and fleshy from the back of the ulna, commencing near its middle, and from the contiguous part of the interosseous ligament. It terminates in a tendon, which goes through the same fossa with the extensor communis; it is afterwards joined,

about the head of the first phalanx, to the tendon of the common extensor belonging to the forefinger.

With the tendon of the extensor communis, it is inserted along the back of the forefinger to the base of the third phalanx.

It extends the forefinger.

At this stage of the dissection it is proper to notice the POSTERIOR CARPAL LIGAMENT, which passes from the side of the radius to the side of the ulna. It is two inches in breadth, and seems to be a continuation of the fascia of the forearm. It will be found strongly attached to the different ridges of the radius and ulna, and, from its want of elasticity, perfectly adapted to prevent the tendons from springing out of their respective grooves. It forms one jugum for the first two extensors of the thumb, another for the radial extensors of the hand, a third for the tendon of the third extensor of the thumb, a fourth for the indicator and extensor communis, and a fifth for the extensor ulnaris.

SECTION IX.

OF THE SMALL MUSCLES OF THE HAND.

The skin and fat being carefully removed from the palm of the hand, we bring into view the APONEUROSIS PALMARIS. This is a triangular tendinous membrane, which covers all the hollow of the hand, and is spread over its muscles. It arises from the anterior carpal ligaments somewhat narrow; it then spreads out, and, dividing into four sections, is fixed to the heads of the metacarpal bones. Each section bifurcates, to allow the flexor tendons to pass to the fingers, and is united to the contiguous sections by transverse bands or fræna. The muscles of the ball of the thumb and of the little finger are covered by a thin membrane extended from the lateral margins of this aponeurosis.

The PALMARIS BREVIS is apt to be cut away unconsciously; it is just below the skin at the inner side of the hand. It consists of separate fasciculi unequally divided,

Fig. 131.

A Front View of the Palmar Fascia.

and arises from the ligament of the wrist, and from the ulnar side of the palmar aponeurosis.

It is inserted into the skin and fat at the inner margin of the hand, and covers the muscles of the little finger.

It contracts the skin of the hand.

The Aponeurosis Palmaris being removed, a good view is obtained of the long flexor tendons and many of the small muscles of the hand.

The Lumbricales are conspicuous; they are four in number, of the size and shape of earth-worms. They arise, tendinous and fleshy, from the radial sides of the tendons of the flexor profundus, beneath the ligamentum carpi annulare, and a little beyond its anterior edge.

They terminate in little flat tendons, which run along the outer or radial edges of the fingers, and are inserted into the tendinous expansion on the back of the first phalanx of each finger, about its middle.

They bend the first phalanges.

Four muscles constitute the ball of the thumb.

1. The Abductor Pollicis Manus arises tendinous and fleshy from the anterior surface of the ligamentum carpi annulare, and from the projecting ends of the trapezium and scaphoides.

It is inserted tendinous into the outer side of the base of the first phalanx of the thumb, and into the tendinous membrane derived from the extensors on its back part.

It draws the thumb from the fingers. This muscle is next to the skin.

2. The Opponens Pollicis is beneath the abductor, and without its removal can scarcely be seen. It arises, tendinous and fleshy, from the projecting point of the os trapezium, and from the adjacent part of the annular ligament.

It is inserted, tendinous and fleshy, into the radial edge of the metacarpal bone of the thumb, from its base to its head.

It draws the metacarpal bone inwards.

3. The Flexor Brevis Pollicis Manus is beneath the abductor pollicis, and at the ulnar side of the opponens pollicis. A groove is formed in it by the tendon of the flexor longus pollicis, which divides it into two heads.

The first head arises fleshy from the points of the trapezium, trapezoides, and from the contiguous part of the internal surface of the annular ligament, and is inserted into the outer sesamoid bone; the sesamoid bone, like a patella, being connected to the first phalanx of the thumb by tendon.

The second or internal head arises fleshy from the magnum and unciform, near their metacarpal surfaces, and from the base of the metacarpal bone of the middle finger. It is inserted into the inner sesamoid bone, which, like the external, is connected by ligament to the first phalanx.

The short flexor, as its name implies, bends the first joint of the thumb.

4. The ABDUCTOR POLLICIS MANUS lies in the palm of the hand beneath the lumbricales and the tendons of the flexor sublimis and profundus. It arises, fleshy, from the ulnar edge of the metacarpal bone of the middle finger, between its base and head.

It is inserted tendinous into the inner part of the base of the first phalanx of the thumb, near the internal sesamoid bone.

It pulls the thumb towards the fingers.

The ABDUCTOR INDICIS MANUS is on the radial edge of the hand, between the metacarpal bones of the forefinger and thumb, and is just beneath the skin. It arises tendinous from the trapezium, and fleshy from the ulnar edge of the metacarpal bone of the thumb, between its base and head.

Being placed along the side of the metacarpal bone of the forefinger, it is inserted by a short tendon into the radial side of the first phalanx.

It draws the forefinger from the others.

There are three muscles constituting the fleshy part of the ulnar side of the hand, or the ball of the little finger.

1. The ABDUCTOR MINIMI DIGITI MANUS is the most superficial. It arises fleshy from the protuberance on the internal side of the os pisiforme, and from the contiguous parts of the annular ligament.

It is inserted tendinous into the ulnar side of the first phalanx of the little finger, and into the tendinous membrane which covers its back part.

It draws the little finger from the rest.

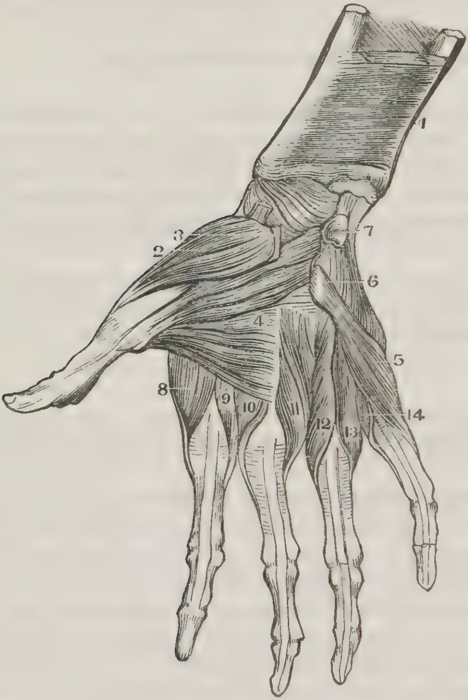
2. The FLEXOR PARVUS MINIMI DIGITI MANUS is beneath the abductor. It arises fleshy from the unciform process of the os unciform, and from the contiguous part of the annular ligament.

It is inserted, tendinous, into the ulnar side of the base of the first phalanx of the little finger, being united with the tendon of the abductor, and with the tendinous membrane expanded over the back of the finger.

It bends the little finger.

Fig. 132.

A Front View of the deep-seated Palmar Muscles.



1. Pronator Quadratus.
2. Opponens Pollicis.
3. Its attachment to the Annular Ligament.
4. Adductor Pollicis arising from the whole front of the second Metacarpal bone (Os Trapezium and Os Magnum).
5. Adductor Metacarpi Minimi Digiti.
6. Its Origin from the Os Unciforme.
7. Os Pisiforme.

8, 9, 10, 11, 12, 13, 14. Interossei Muscles.

8. Prior Indicis.
9. Posterior Indicis.
10. Prior Medii.
11. Posterior Medii.
12. Prior Annularis.
13. Posterior Annularis.
14. Interosseous Digiti Auricularis.

3. The ADDUCTOR METACARPI MINIMI DIGITI is placed beneath the abductor and flexor, next to the metacarpal bone. It arises fleshy from the unciform process of the os unciforme, and from the contiguous part of the annular ligament of the wrist.

It is inserted, tendinous and fleshy, into the fore part of the metacarpal bone of the little finger, from its base to its head.

It brings the metacarpal bone of the little finger towards the others, and thereby deepens the hollow of the hand.

The INTEROSSEOUS MUSCLES fill up the interstices of the metacarpal bones; they are seven in number, four on the palm and three on the back of the hand. The back ones arise by double heads from the contiguous sides of two metacarpal bones; the palmar ones have each a single head only, which comes from the metacarpal bone of the finger, which each interosseous muscle is intended to serve. As a general description, they all may be said to arise fleshy and tendinous from the base and sides of the metacarpal bones, and to be inserted tendinous into the sides of the first phalanges, and into the tendinous membrane on the backs of the fingers, derived from the tendons of the extensor communis. The first four are very deeply seated on the palm of the hand, but the three others are on the back.

1. The PRIOR INDICIS is along the radial side of the first metacarpal bone, or that of the first finger, and arises from the base and side of the same.

It is inserted tendinous into the radial side of the first phalanx of the forefinger.

It draws the forefinger towards the thumb.

2. The POSTERIOR INDICIS is at the ulnar side of the first digital metacarpal bone. It arises from the base and ulnar side of the same bone, and is inserted tendinous into the ulnar side of the first phalanx of the forefinger.

It draws the forefinger towards the others.

3. The Prior Annularis is at the radial side of the metacarpal bone of the third or ring-finger, and arises from the base and radial side of the said bone.

It is inserted tendinous into the radial side of the first phalanx of the ring-finger.

It draws that finger towards the thumb.

4. The Interosseous Digiti Auricularis is at the radial side of the metacarpal bone of the little finger, and arises from the radial side and base of said bone.

It is inserted tendinous into the radial side of the first phalanx of the same finger.

It draws the little finger towards the others.

By removing the tendons of the extensor communis from the back of the hand, we see the three posterior or double-headed interosseous muscles.

5. The Prior Medii is between the metacarpal bones of the fore and middle finger, and arises from the opposite roots and sides of these bones.

It is inserted tendinous into the radial side of the first phalanx of the middle finger.

It draws the middle finger towards the thumb.

6. The Posterior Medii is between the metacarpal bones of the middle and ring-fingers, and arises from the opposite sides and roots of these bones.

It is inserted tendinous into the ulnar side of the first phalanx of the middle finger.

It draws the middle finger towards the little one.

7. The Posterior Annularis is between the metacarpal bones of the ring and little finger, and arises from the opposed sides and roots of these metacarpal bones.

It is inserted tendinous into the ulnar side of the first phalanx of the ring-finger.

It draws the middle towards the little finger.

CHAPTER IX.

OF THE EXTREMITIES.

SECTION I.

SUPERFICIAL FASCIA.

[BEFORE proceeding to the study of the deeper-seated portions of the inferior extremities, the student should pay attention to the parts more directly connected with the skin. To do this, let him make an incision through the integument of the groin, commencing in the line of Poupart's ligament, midway between the anterior superior spinous process of the ileum and the pubis, and carrying it down the limb in the course of the femoral artery, along the inner side of the knee, terminate it at the tubercle of the tibia. The integument being now carefully dissected off inwards and outwards, the superficial fascia will be exposed, studded with particles of yellow fat, contained in the cells of the areolar tissue. This fascia, where it covers the thigh, will be found to consist of two laminæ, or layers, within which are situated the superficial or cutaneous bloodvessels and nerves. An incision should now be made in this fascia in the same line as that previously made through the integument, when it should be turned off in a similar manner. The parts to be examined in connection with the superficial fascia are, first,

The Inguinal Glands.
" Superficial Circumflex Illii Artery.
" " Epigastric, or Arteria Ad Cutem Abdominis.
" External Pudic Artery.
" Internal Saphena Vein and its tributaries.
" External, Middle, and Internal Cutaneous Nerves.

The INGUINAL GLANDS will be found in a chain or group along the line of Poupart's ligament. They consist of a superficial and deep-seated layer, and receive the cutaneous lymphatics of the genital organs, lower limb, and lower part of the abdomen. The three small arteries are branches given off by the femoral artery, immediately below Poupart's ligament; they are the Superficial Circumflex Illii, Superficial Epigastric, and Superficial Pudic. Passing through the deep fascia they are distributed as follows: The *first* upward and outwards, toward the crest of the ileum; the *second* upward over the abdomen; and the *third* inwards, towards the scrotum, or labia majora.

The Internal Saphena Vein frequently consists of two parallel trunks, and brings the blood from the internal side of the foot, leg, and thigh. It passes up along its inner aspect, and terminates in the femoral vein, through an opening seen in the fascia lata femoris, and hence called the Saphenous Opening. Just as the vein turns inward to enter this opening, it receives a number of tributaries from the abdomen, hip, and organs of generation.

The EXTERNAL CUTANEUS NERVE arises from the second lumbar, penetrates the fascia femoris a short distance below the anterior superior spinous process of the ileum, and divides it into two sets of branches, the most exterior of which passes to the outer and posterior side of the thigh; the other goes to the outer and anterior aspect of the limb, as low down as the knee.

The MIDDLE CUTANEUS NERVES consists of two or three branches, which are derived from the Anterior Crural Nerve. These nerves pierce the deep fascia, and are expended in the fascia superficialis and integument, as low down as the preceding nerve.*

The INTERNAL CUTANEUS NERVE is derived from the genito-crural. Piercing the deep fascia a few inches below Poupart's ligament, it passes along the inner side

* Wilson, p. 356.

Fig. 133.
A View of the Saphena Major Vein.

1. Ad Cutem Abdominis Vein.
2. Internal Pudic Vein.
3. Superficial Circumflex Vein.
4. Origin of the Saphena Major.
5. Its termination in the Femoral Vein.

of the limb, also towards the knee. By removing the superficial fascia, we shall be able to see the fascia lata femoris.—A.]

SECTION II.

FASCIA LATA FEMORIS.

The Muscles of the lower Extremity, from the pelvis to the foot inclusively, is enveloped by a strong Fascia or Aponeurotic Membrane, lying between the skin and the muscles. This fascia consists, for the most part, of ligamentous fibres, passing in the direction of the length of the limb, secured together by transverse filaments of the same matter, but by no means so abundant. Its structure undergoes some variations; its greater part is decidedly of the character just mentioned; but at the groin it is between the ligament and cellular membrane; the latter occasionally predominates so much that the appearance of the first is lost, particularly in corpulent subjects. On the contrary, in the lean, and such as have suffered from the pressure and irritation of the part by hernial protrusion, the ligamentous structure is well developed. On the Gluteus Magnus, also, this fascia exists as a condensed cellular membrane, sending in its processes between the fasciculi of the muscle.

The thickness of the Fascia Femoris is not uniform. On the outer side of the thigh, knee, and hip, it is very thick and strong; on the inner side it is thin and weak compared with the other. It is thick on the anterior part of the leg, and somewhat thinner on the posterior; but in neither is it so thick as at the outer part of the thigh. At the ankle it is connected with the bony prominences around it, and, increasing in thickness, it constitutes the annular ligament of the joint for confining the tendons on its anterior part. It is also extended over the foot, and is connected at different points to its margin, so as to keep itself tense.

This membrane is very closely attached to the cellular membrane at every point of its external surface, and is kept tense all over, by its bony connections. Above, it arises from the exterior margin of the pelvis, as constituted by the pubes, Poupart's ligament, the crista of the ilium, the side of the sacrum and the ischium. At the knee, it is fastened to the condyles of the os femoris, and to the head of the tibia and fibula. On the posterior part of the thigh it sends in a long process, by which it adheres to the linea aspera. Its connection with the knee and ankle below fixes it on the leg, besides which it adheres to the spine of the tibia.

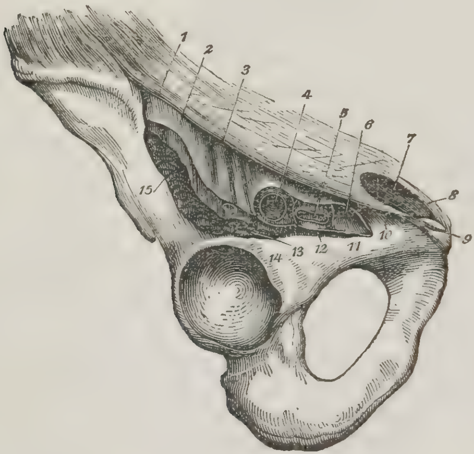
Its connection with the muscles of the lower extremity is very interesting; to some of them it adheres by its internal face, and to others it does not. To the muscles of the hip it adheres closely, and gives origin to some of the fibres of the gluteus medius. To the muscles of the exterior face of the thigh its adherence is generally loose, and indeed, in some parts, scarcely deserves to be considered as such, as where the internal surface of the fascia is opposed to the tendinous facing of the vastus externus muscle. On the internal semi-circumference of the thigh it adheres somewhat closely to the muscles, by cellular membrane. On the leg it is in close connection with the muscles of its anterior and fibular side, many of their fibres arising from it; but on the posterior face of the leg it is rather loosely fixed to them. From the internal face of the fascia, prolongations of cellular membrane, of various densities, sometimes ligamentous, are sent in between most of the muscles. These prolongations separate the muscles from each other, form sheaths in which they repose, and preserve them in their position. As an envelop to the muscles of the leg, the fascia is highly useful in supporting and sustaining their action, and plays an important part in the course of suppurations in this region.

SECTION III.

OF THE PARTS CONCERNED IN FEMORAL HERNIA.

After the student has become acquainted with the parts just described, he may next proceed to the study of their relations to Femoral Hernia. The study of Femoral Hernia should be commenced with precise ideas of the concave edge of the os innominatum, which terminates externally by the anterior-superior spinous process of the ilium, and internally by the symphysis pubis; also of the muscles of the lower extremity, which are connected with this edge; and of the insertion of the tendon of the external oblique.

Fig. 134.



1. Poupart's Ligament.
2. Fascia Iliaca.
3. Points to the Crural Nerve.
4. Femoral Artery.
5. Femoral Vein.
6. Crural or Femoral Canal.
7. External Abdominal Ring.
8. Internal or Upper Column of the Ring.
9. External or Lower Column.
10. Gimbernat's Ligament.
11. Os Pubis.
12. Portion of Fascia Transversalis, which, in union with the Fascia Iliaca, forms the sheath of the Femoral Vessels.

13, 15. Psoas and Iliacus Muscles.

Two of the layers which cover femoral hernia having been already turned off, namely, the *skin* and superficial *fascia*, the first point of study will be the fascia femoris.

The Fascia Femoris is beneath the fascia superficialis; a knowledge of its disposition at the groin is indispensable to a comprehension of femoral hernia. When the fascia superficialis is cleared away, this fascia femoris is seen to arise at the groin along the anterior edge of Poupart's ligament, from the anterior-superior spinous process of the ilium to within a short distance of the spine of the pubes. This portion of it is thin, and through it the sartorius muscle may be seen; it is therefore called the Sartorial Fascia. The fascia femoris also arises from the spine and crest of the pubes, and along its ilio-pectineal ridge, which is a continuation of the same; this latter portion covers the pectineus muscle, and is called the Pectineal Fascia. The pectineal fascia is behind the femoral artery and vein, and the sartorial fascia is before them. (See Fig. 134.)

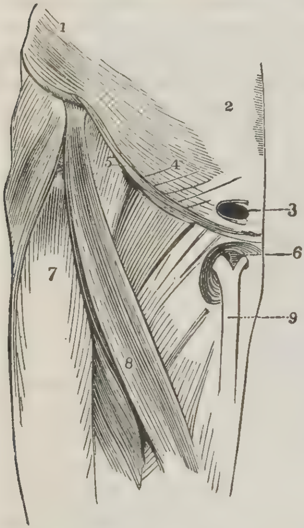
The Saphena Vein is placed between the fascia femoris and the fascia superficialis, and runs up along the inner side of the thigh, to join the femoral vein an inch and a half below Poupart's ligament. Raise the saphena where it joins the femoral vein, and beneath this junction a rounded semicircular edge of the fascia femoris will be seen, where the sartorial fascia becomes continuous with the pectineal. Apply the end of a finger to this edge and draw it downwards. Immediately on its being made tense, the sartorial fascia will show itself to terminate by a thin edge in front of the femoral vein. This edge is concave or crescentic, and extends from the junction of the sartorial and pectineal fascia, to the crista of the pubes; it is frequently reticulated. At the upper end of this crescent the sartorial fascia terminates in a point or angle, which is directed deeply towards the upper branch of the pubes. The upper margin of this angle is closely connected with the edge of Gimbernat's ligament, and the point is inserted into the crista of the pubes in the same line with Gimbernat's ligament, but exterior to it, just at the internal margin of the femoral vein. This angular production or elongation of the sartorial fascia is called Hey's, or the Femoral Ligament. The free edge of it is turned towards the femoral bloodvessels, by a sort of half twist.

The preceding arrangement of the fascia femoris for the transmission of the saphena vein and the superficial lymphatics, gives the appearance of an oval aperture, called the Saphenous opening.

By introducing a finger under Hey's ligament into the abdomen, we shall find that the crural arch or Poupart's

Fig. 135.

PLAN REPRESENTING THE UPPER PART OF THE THIGH WITH THE SKIN AND SUBCUTANEOUS AREOLAR TISSUE DISSECTED OFF, SO AS TO SHOW THE FEMORAL APONEUROSIS AND ITS SAPHENOUS OPENING.



1. Fleshy Portion of the External Oblique Muscle of Abdomen.
2. Tendinous Portion of the same.
3. External Abdominal Ring.
4. Inter-Columnar Tendinous Fibres.
5. Crural Arch.
6. Saphenous Opening, through which (9) the Saphenous Vein reaches the Femoral Vein.
7. Thigh covered by the Fascia Lata.
8. Outline of the Sartorius Muscle, seen through the Fascia Lata Femoris.

[The muscles are represented too distinctly in the cut. When covered by the fascia their edges are not so strictly defined.]

ligament, and the sartorial fascia, exercise a mutual tension on each other, like the falx major and the tentorium; by abducting the limb very much, and turning the toe outwards, the greatest rigidity is given to both; but by making the limb cross the other, and turning the toe inwards, both are relaxed.

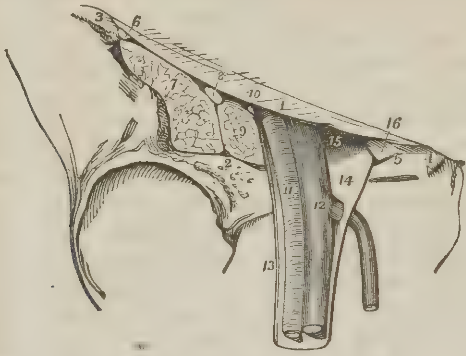
A posterior view may now be taken, by looking into the abdomen, the peritoneum being separated from the abdominal muscles, and from the iliacus internus and psoas magnus, so as to bring into view another fascia, the Fascia Iliaca.

The FASCIA ILIACA is a tendinous membrane, which lies on the iliacus internus and psoas magnus muscles, and is continued into the tendon of the psoas parvus. Externally, it is connected to the margin of the crista of the ilium; at the internal edge of the psoas magnus it is connected with the brim of the pelvis, and sinks into the cavity of the pelvis, being continuous with the Aponeurosis Pelvica. Below, it is inserted into the edge of the crural arch, from the anterior-superior spinous process of the ilium, almost to the body of the pubes. The external iliac vessels are upon this fascia, between it and the peritoneum; by raising them with a knife-handle, it will be seen that the fascia iliaca goes over that part of the pubes which gives origin to the pectineus muscle, and that it is continuous with the pectineal fascia. If the student has a preparation in which everything has been removed from the os innominatum except the insertion of the tendon of the external oblique, it will be of essential service to him here; for by it he will see the arched form of the edge of the tendon next to the bone, from whence the name of Crural Arch; the vacancy which exists between the bone and the arch; and the insertion of Gimbernat's ligament from the spine of the pubes, an inch or more along its crista. He will thus more readily understand how this space is only partly filled by the iliacus internus and psoas magnus muscles, and that, if the fascia iliaca had not an attachment to the crural arch, so as to keep it down towards these muscles, hernial protrusions would be constantly occurring.

The Iliac vessels pass beneath the crural arch on the inner margin of the psoas magnus muscle, the vein being nearest the pubes, and the artery at the outer side of the vein. Close inspection will satisfy us that the fascia iliaca is inserted into the crural arch as far as the vein, and may indeed be traced to the crista of the pubes, and that it is so connected with the vessels that no opening for hernia exists between them, or indeed in all the space from the internal margin of the vein to the anterior-superior spinous process of the ilium. But at the inner side of the vein, between it and Gimbernat's ligament, an opening appears, called the Crural or Femoral Ring, and is the place where femoral hernia commences. This opening is generally occupied by a lymphatic gland, and a lamina

Fig. 136.

The Femoral or Crural Arch, and the Structures situated between it and the Anterior Part of the Superior Margin of the Pelvis.



1. The Crural Arch, or Poupart's Ligament.
2. Pubic Bone.
3. Superior Anterior Spine of the Ilium.
4. Spine of the Pubis.
5. Pectineal Line, and the insertion of Gimbernat's Ligament.
7. Iliac Muscle cut.
8. Crural Nerve cut.
9. Great Psoas Muscle cut.
10. Point at which the Crural Branch of the Genito-Crural Nerve reaches the Thigh.
11. Femoral Artery.
12. Femoral Vein, receiving the Saphena Vein.
13. External Portion of the Sheath of the Femoral Vessels lying in contact with the Femoral Artery.
14. The large funnel-shaped Cavity of the Sheath on the Inner Side of the Femoral Vein.
15. Internal Femoral Ring, bounded *above* by the Crural Arch, *behind* by the Pubis, *externally* by the Vein, and *internally* by the free edge of (16) Gimbernat's Ligament.

of condensed but loosely attached cellular substance, called sometimes the Cribriform Fascia, which is continuous with the Aponeurosis Pelvica.

Make a cross cut of an inch in length through the fascia iliaca; and then introducing the finger or a knife-handle through this cut, downwards, the conceptions of the attachment of the fascia iliaca with the crural arch, and its continuity with the fascia pectinea, will be much improved.

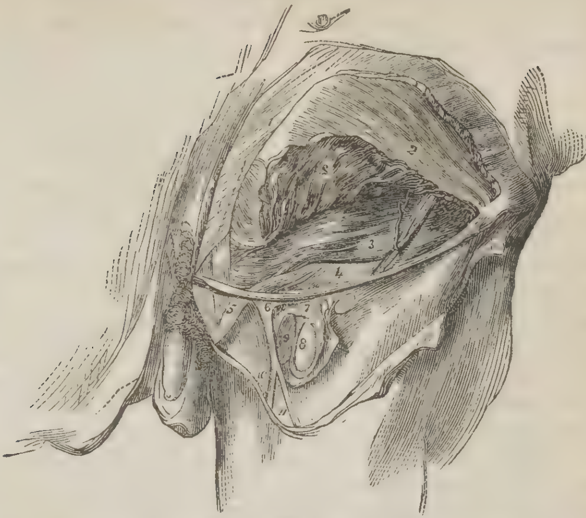
The femoral vessels are enveloped by a sheath. To see this distinctly, separate the fascia transversalis from the transversalis muscle; cut vertically through the falciform process of the fascia lata femoris, over the artery, and continue the cut also through Poupart's ligament, taking care to injure as little as possible the fascia transversalis. To render this part of the examination convenient, only a narrow flap of the abdominal muscles should be left at the groin. By turning the falciform process, with that part of Poupart's ligament to which it adheres, towards the symphysis pubis, we shall see that the fascia transversalis is not only attached to the edge of the crural arch, but that it continues to the thigh in front of the femoral vessels. The fascia iliaca, besides its connection with the pectineal fascia, gives a layer to the posterior face of the femoral vessels. The sheath of the femoral vessels is by this method of examination proved to be formed from the fascia transversalis in front, and the fascia iliaca behind. Mr. Colles has adopted a very satisfactory mode of describing the formation of the crural sheath, which I think more expressive than such as are most in use. The fascia transversalis and iliaca, he considers as a continuous membrane, which may be compared to a funnel, from the manner in which it lines the lower part of the abdomen. The inner half of the funnel is deficient. From its lower part proceeds the membranous pipe which surrounds the femoral vessels, and constitutes their sheath. This sheath is very separable from the sartorial fascia in front and the pectineal fascia behind, and may be easily traced to the entrance of the saphena vein into the femoral. On the thigh, just below Poupart's ligament, it has a number of foramina in it, occasioned by the passage of the lymphatic and other vessels from the surface of the thigh.

The texture of this sheath is evidently filamentous and fibrous, and there are many of these fibres passing from it to the sartorial fascia, and its lunated edge.

At the place where the fascia iliaca is united to the crural arch a white line appears, formed by their union; in this is fixed the Arteria Circumflexa Illii, coming from the external iliac. The Epigastric artery is about half an inch distant from the femoral or Crural Ring, at its outer side. Occasionally, the Obturator Artery comes from the Epigastric, and winds around the internal margin of this ring. As the iliac vessels enter the sheath beneath Poupart's ligament, a close fibrous connection is formed from them to the sheath, both anteriorly and posteriorly, which sends a partition between the artery and the vein, and a partition also on the inner side of the vein. By such an arrangement hernial protrusions are prevented at this spot; the only opening for them being at the inner side of the vein, between it and Gimbernat's Ligament, or at the Crural ring, as stated.

When an intestine descends, it passes into the femoral sheath, on the inner side of the Iliac vein; follows the course of this vein down the sheath, till it comes to an aperture made by one of the lymphatic vessels or veins; then protrudes through this aperture, and lastly gets under the fascia superficialis. The route thus indicated constitutes the Femoral Canal of Cloquet. Afterwards, if the hernia increase, instead of continuing to descend, it turns upwards and outwards, towards the anterior-superior spinous process of the Ilium. From this it is obvious that the places of stricture may be: First, the opening in the femoral sheath for a lymphatic or small vein; Secondly, Hey's Ligament; and Thirdly, the edge of Gimbernat's Ligament, which looks towards the iliac vein. Mr. Colles, whose opinions are entitled to the utmost respect, thinks that surgeons err in regard to the third place, and that the stricture is formed there, by the internal margin of the commencement of the sheath of the femoral vessels instead of by Gimbernat's ligament. He says that this orifice remains with a sharp and distinct edge, even when Gimbernat's ligament is taken completely out of the way, and that the edge of Gimbernat's ligament, supposed to constitute this stricture, stops several lines short of the Crural

Fig. 137.



AFTER THE REMOVAL OF THE LOWER PART OF THE EXTERNAL OBLIQUE (WITH THE EXCEPTION OF A SMALL SLIP INCLUDING THE CRURAL ARCH), THE LOWER PORTION OF THE INTERNAL OBLIQUE WAS RAISED, AND THE TRANSVERSALIS MUSCLE AND FASCIA THEREBY BROUGHT INTO VIEW. THE FEMORAL ARTERY AND VEIN ARE SEEN TO A SMALL EXTENT, THE FEMORAL APONEUROSIS (FASCIA LATA) HAVING BEEN TURNED ASIDE AND THE SHEATH OF THE VESSELS LAID OPEN.

1. External Oblique Muscle.
2. Internal Oblique.
2′. Part of same turned up.
3. Transversalis Muscle. Upon the last-named Muscle is seen a Branch of the Circumflex Iliac Artery with its accompanying veins; and some ascending tendinous fibres are seen over the conjoined tendon of the two last-named muscles.
4. Transversalis Fascia.
5. Spermatic Cord covered with the Tubular or Infundibuliform Prolongation of the Transversalis Fascia.
6. Upper Angle of the Iliac part of the Femoral Aponeurosis.
7. Sheath of the Femoral Vessels.
8. Femoral Artery.
9. Femoral Vein.
10. Saphena Vein.
11. A Vein joining it.

Ring. A dissection performed in the manner that he recommends is unquestionably in favor of his position.

The Anterior Crural Nerve has but little to do with this dissection, as it is placed beneath the fascia iliaca, and is on the outside of the artery.

SECTION IV.

OF THE MUSCLES OF THE FRONT OF THE THIGH.

The PSOAS MAGNUS, PSOAS PARVUS, and ILIACUS INTERNUS have been described at pages 120, 121.

The SARTORIUS MUSCLE is the first of those on the thigh which demands attention. It is placed superficially on the internal side of the thigh, and arises by a short tendon from the anterior-superior spinous process of the ilium. A body, of various breadths in different subjects, is then formed, whose fibres are in the direction of its length. It passes in a spiral course to the inner side of the thigh and to the back of the internal condyle, and, winding under the head of the tibia, advances forwards so as to be inserted into the side of the lower part of its tubercle, by a broad tendon. The lower edge of the tendon is continued into the fascia cruralis, by which this muscle is preserved in its spiral direction.

The sartorius muscle is placed in its whole course immediately beneath the fascia femoris; it crosses the rectus femoris, vastus internus, and triceps adductor; at the lower part of the thigh, just above the knee, it is between the tendon of the latter and that of the gracilis.

It bends the leg and draws it obliquely inwards.

The TENSOR VAGINÆ FEMORIS is a short muscle just on the outer side of the origin of the sartorius; it arises, tendinously, from the anterior-superior spinous process of the ilium, and passes downwards and somewhat backwards, between two laminæ of the fascia femoris.

It is inserted, a little below the level of the trochanter major, into the inner face of the fascia femoris. It rotates the foot inwards, and makes the fascia tense.

The RECTUS FEMORIS is in front of the thigh-bone, and just beneath the fascia femoris, with the exception of

Fig. 138.

A View of the Muscles on the Front of the Thigh.

1. Tensor Vaginæ Femoris.
2. Pectineus.
3. Rectus Femoris.
4. Vastus Externus.
5. Vastus Internus.
6. Sartorius.
7. Adductor Longus.

its origin, which is covered by the sartorius. It is a complete penniform muscle, fleshy in front for the most part, but faced behind with tendon. It arises from the anterior-inferior spinous process, by a round tendon, which is joined by another tendon coming from the superior margin of the acetabulum.

It is inserted into the superior surface of the patella by a strong tendon, and intermediately by the ligamentum patellæ into the tubercle of the tibia.

It extends the leg.

Under the rectus femoris, the anterior and lateral parts of the thigh-bone are enveloped by a large muscular mass, considered, by most anatomists, as three distinct muscles, called Vastus Externus, Vastus Internus, and Cruræus or Cruralis. Their heads are very distinguishable from each other; but below they are inseparably united and join with the patella.

The Vastus Externus, a very large muscle on the outside of the thigh, arises, tendinous and fleshy, from the upper part of the os femoris immediately below the trochanter major. Its origin commences in front, and passes obliquely around the bone to the linea aspera. It continues afterwards to arise the whole length of the linea aspera, and from the upper half of the line running from it to the external condyle.

Its fibres pass inwards and downwards, and are inserted by a flat tendon into the external edge of the tendon of the rectus, and also into the external upper part of the patella. This muscle has a broad tendinous surface exteriorly and above; at its lower part it has a tendinous facing on the side next to the bone.

It also extends the leg.

The Vastus Internus covers the whole inside of the os femoris. It arises by a fleshy and pointed origin, in front of the os femoris, just on a level with the trochanter minor, tendinous and fleshy, from the whole length of the internal edge of the linea aspera, and from the line leading from it to the internal condyle.

Its fibres descend obliquely, and are inserted by a flat tendon into the internal edge of the tendon of the rectus, and into the upper internal edge of the patella.

It also extends the leg.

The Cruræus Muscle is almost completely overlapped and concealed by the two vasti, and is immediately behind the rectus femoris. The edge of the vastus externus above, is very distinguishable from it, as it overlaps it, and is rounded off, besides being somewhat separated by vessels. But the origin of the cruræus on the side of the vastus internus is not so distinct, as the fibres of the two muscles run together; it is therefore necessary most frequently to cut through some of the fibres on the internal face of the os femoris on a level with the trochanter minor. The cruræus will then be seen to arise, fleshy, from all the fore part of the bone, and from all its outside as far as the linea aspera. Between the internal edge of this muscle and the linea aspera the interior face of the os femoris is unoccupied, for an inch, along the whole shaft of the bone, which is very readily seen by turning off the vastus internus.

The Cruræus is inserted into the posterior face of the tendon of the rectus below, and into the upper surface of the patella.

It also extends the leg.

A small fasciculus at the lower part of this muscle, which is inserted into the synovial membrane of the knee-joint, is called by some the Sub-Cruræus.

The Ligamentum Patellæ is the common cord, by which the action of the four last-named muscles is communicated to the tibia. It is a flattened thick tendon, an inch and a half wide, arising from the inferior edge of the patella, and inserted into the tubercle of the tibia. Besides this, a fascia or tendinous expansion, a continuation of the fascia of the thigh, and called INVOLUCRUM, comes from the inferior ends of these muscles, and extends itself over the whole of the anterior and lateral parts of the knee-joint, and is inserted into the head of the tibia and of the fibula. Through this it happens that, even when the patella or its tendon is fractured, some motion or extension may be communicated to the leg from the thigh.*

In consequence of the common insertion of these four muscles, some anatomists describe them as but one, under the name of QUADRICEPS FEMORIS.

A bursa exists between the lower part of their tendon and the fascia femoris, higher up than the patella; occasionally, one is found still lower down on the patella.

* A case of this kind was formerly in the Philadelphia Almshouse.

The GRACILIS is a beautiful muscle at the inner margin of the thigh, which lies immediately under the fascia, and extends from the pelvis to the leg.

It arises by a broad thin tendon from the front of the os pubis just at the lower part of its symphysis, and from its descending ramus; the muscle tapers to a point below, and a little above the knee terminates in a round tendon, which passes behind the internal condyle of the os femoris and the head of the tibia. It then makes a curve forwards and downwards at the internal side of the latter, and is inserted at the lateral and inferior part of its ubercle.

Fig. 139.

ADDUCTOR MUSCLES, WITH THE OBTURATOR EXTERNUS.

1. Femur.
2. Ilium.
3. Pubis.
4. Obturator Externus.
5. Superior Fasciculus of the Adductor Magnus.
6, 7. Adductor Brevis.
8. Adductor Longus.
9, 10. Adductor Magnus.
11. Foramen for the Passage of the Perforating Arteries.
12. Same for Femoro-Popliteal Vessels.

The tendon at the knee is beneath the tendon of the sartorius. This muscle is a flexor of the leg.

The PECTINALIS OR PECTINEUS is a short fleshy muscle at the inner edge of the psoas magnus. It arises fleshy from the concavity on the upper face of the pubes between the linea innominata and the ridge above the obturator foramen; and is inserted tendinous into the linea aspera, immediately below the trochanter minor.

It draws the thigh inwards and forwards.

The TRICEPS ADDUCTOR FEMORIS is a large muscular mass, consisting of three distinct portions, which are placed at the inner side of the thigh, and contribute much to fill up the vacuity between the thigh bones above. These portions are

1. The ADDUCTOR LONGUS, which comes by a short rounded tendon from the upper front part of the pubes, near its symphysis; it forms a triangular belly, which increases in breadth in its descent, and is inserted into the middle third of the linea aspera, at its inner edge.

This muscle, as the subject lies on its back, is the uppermost of the three; its origin is between that of the pectinalis and of the gracilis; its upper edge is in contact with the lower edge of the pectinalis.

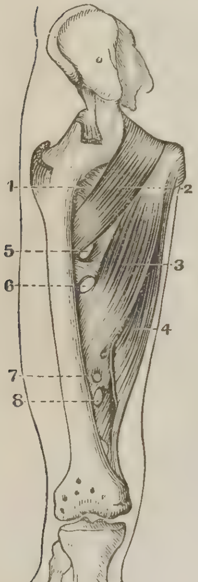
2. The ADDUCTOR BREVIS is the smallest of the three; and is situated beneath the adductor longus and pectineus, and on the outside of the gracilis. It arises by a rounded tendon from the middle front part of the pubis, between its symphysis and the foramen thyroideum, just below the origin of the first adductor.

It is inserted into the upper third of the inner edge of the linea aspera; between the trochanter minor and the upper edge of the adductor longus, by a flat thin tendon.

3. The ADDUCTOR MAGNUS is below the other two, and is by far the largest. It arises, fleshy, from the lower part of the body of the pubes, and from its descending ramus, also from the ascending ramus of the ischium, as

far as its tuberosity, occupying the whole bony surface between the foramen thyroideum below and the margin of the bone.

Fig. 140.
ANOTHER VIEW OF THE ADDUCTOR MUSCLES WITH THE PECTINEUS.



1. Upper Part of Adductor Magnus.
2. Pectineus.
3. Adductor Longus.
4. Adductor Magnus.
5, 6. Foramina for the First and Second Perforating Arteries.
7, 8. Foramina for the Femoro-Popliteal vessels.

It is inserted, fleshy, into the whole length of the linea aspera; and on its internal margin a tendon is gradually generated, which passes downwards, to be inserted into the upper part of the internal condyle of the os femoris, and by a thin edge or expansion into the line leading from the linea aspera to the internal condyle.

The Adductor Magnus separates the muscles on the anterior from such as are on the posterior part of the thigh, and its insertion is closely connected with the origin of the vastus internus, the two surfaces adhering by a short and compact cellular membrane.

The three adductors contribute to the same end, that of drawing the thigh inwards.

SECTION V.

OF THE BLOODVESSELS OF THE THIGH.

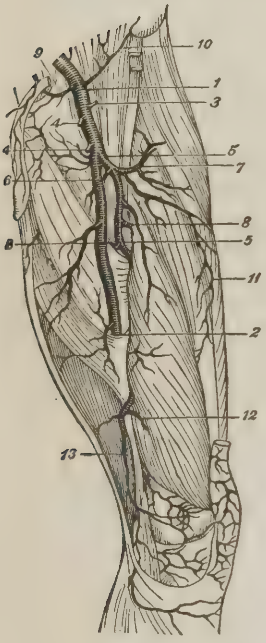
§ 1. OF THE ARTERIES OF THE THIGH.

The FEMORAL ARTERY (Arteria Femoralis) is a continuation of the external iliac. It appears first on the thigh, half-way, or nearly so, between the symphysis pubis and the anterior-superior spinous process of the ilium. Emerging from beneath Poupart's ligament, it is there covered only by the skin and fascia of the part, having the femoral vein at its inside, and the trunk of the anterior crural nerve, about half an inch from it, on the outside. It lies upon the psoas magnus muscle, crosses the pectineus, and the whole of the insertion of the adductor longus muscle. About one-third of the length of the thigh-bone from below, it penetrates the insertion of the adductor magnus and gets to the ham, being then behind the limb. For the upper third of its course the femoral artery is at the inner edge of the rectus femoris, and but a little distance from it; it then inclines inwards and occupies the angle formed by the contact of the vastus internus, and the adductor longus. Above, the sartorius is at its outside; but as this muscle inclines very rapidly inwards, immediately after its origin, it in a little time begins to pass along the external margin of the artery; and shortly afterwards covers the artery completely to the place where it penetrates the adductor. Where the artery lies in the angle formed by the adductor longus and the vastus internus, it is covered by a strong interlacing of tendinous fibres from the muscles, and is also enveloped by its own cellular coat.

To cut upon the femoral artery in any part of its course, lay the subject horizontally, and turn the leg outwards, so that the external margin of the sole of the foot will be in contact, or nearly so, with the table. A line drawn then from midway between the anterior-superior spine of the ilium and the symphysis pubis to the centre of the internal condyle of the os femoris will be precisely over it.*

Fig. 141.

Arteries seen on the Front of the Thigh.



1, 2. Femoral Artery.
3. Superficial Epigastric, cut off.
4, 4. External Pudics, cut off.
5, 5. Profunda Femoris.
6. Internal Circumflex.
7. External Circumflex.
8, 8. Perforating Arteries.
9. Epigastric.
10. Circumflexa Ilii.
11. Muscular Branch.
12. Superior Internal Articular Artery.
13. One of its Branches. The Popliteal artery begins where the femoral terminates, at 2.

The following branches come from the Femoral Artery:—

1. The Superficial Artery of the Abdomen, called by Haller, Arteria ad Cutem Abdominis, is small, and arises at the lower margin of Poupart's ligament. It goes upwards towards the umbilicus, under the skin, and sends a branch to supply the inguinal glands.

2. The External Pudic Arteries (Arteriæ Pudendæ

* Marjolin.

Externæ) come from the Femoral at the same point, and are two or three in number; they are sent to the integuments and lymphatic glands of the groin, also to the skin of the penis and scrotum of the male, or to the labia externa of the female. One of these trunks arises from the upper internal part of the femoral artery, and the other sometimes from the profunda.

The arteries as yet mentioned anastomose freely with each other; are irregular in their number, size, and origin, but for the most part do not exceed the size of a common knitting-needle.

3. The PROFOUND ARTERY (Arteria Profunda Femoris) is very happily called, by Professor Chaussier, the great muscular artery of the thigh, in consequence of its distribution. It is slightly inferior in size to the femoral itself, and arises from its posterior part on a level with the trochanter minor, but sometimes only five or six lines below Poupart's Ligament. It immediately begins to give off branches externally and internally, but the main trunk of the artery continues for several inches in contact with the femoral artery, or nearly so, and beneath it. It then terminates gradually by branches which penetrate to the back of the thigh.

The Profunda Femoris is distributed as follows:—

a. The EXTERNAL CIRCUMFLEX (Arteria Circumflexa Externa) arises from its external superior part; sometimes, however, from the femoral itself; it passes outwards under the sartorius and the rectus femoris, and divides into two secondary branches. The superior and shorter of these is distributed to the parts about the trochanter major, as the anterior edges of the gluteus medius and minimus, the capsule of the hip-joint, and the heads of the extensor muscles. The second goes along the outside of the thigh to the patella, and is about the size of a crow-quill. It first passes obliquely between the rectus and the cruræus, and then vertically, under the anterior margin of the vastus externus, between it and the cruræus, till it terminates about the knee, by anastomosing with the articular arteries. It is principally distributed to the cruræus and vastus externus muscles.

b. The Internal Circumflex Artery (Art. Circumflexa Interna) arises from the inner side of the profunda, just below the external circumflex, but sometimes it also comes from the femoral. It is somewhat under the size of the other, and penetrates between the psoas magnus and pectineus; it winds under the neck of the os femoris, and divides into two branches which supply the contiguous parts, as the heads of the muscles and the joint.

c. Several ramifications are also sent from the profunda to supply the anterior faces of the adductor muscles; they are irregular in number, size, and place of origin, and have no appropriate names.

d. The Perforating Arteries (Rami Profundi Perforantes), three or four in number, are given off successively, are numerically named, and all penetrate the adductor muscles near the thigh-bone, to get to the back of the thigh.

The First arises immediately below the trochanter minor, and gets through the adductor magnus just below the quadratus femoris, to be distributed about the heads of the hamstring muscles.

The Second penetrates the adductor magnus at the lower part of the insertion of the gluteus maximus into the linea aspera, to be distributed about there, and to the corresponding section of the long head of the biceps flexor cruris.

The Third penetrates the adductor magnus a little below the commencement of the origin of the short head of the biceps, and is distributed thereabouts.

The Fourth penetrates the adductor magnus about an inch and a half above the hole for the femoral artery, and is distributed to the neighboring part of the adductor and to the hamstring muscles.

After the origin of the profunda, the femoral artery gives off three or four twigs the size of a large knitting-kneedle, which are disposed of upon the sartorius, adductors, vastus internus, and integuments; but they are too irregular in number, origin, and course for systematic description.

The Anastomosing Artery (Arteria Anastomotica), the last branch of the femoral, is sent from it just before it enters the aperture in the adductor magnus. This artery descends, in the course of the tendon of this adductor, to the knee, being in front of the tendon, between it and the vastus internus muscle. It is distributed to the parts lying along its course.

§ 2. VEINS OF THE THIGH.

The origin and course of the deep veins of the thigh are so similar to the distribution and course of the arteries, that a description is needless. A venous tube always attends an arterial one, being in contact with it, inclosed in the same sheath, and called by the same name. The smaller arterial branches both in the leg and thigh have each two veins, called Venæ Comites.

The relative situation of the large venous trunks is important. At Poupart's ligament, the femoral vein is at the inside of the artery; at the passing of the adductor tendon, the vein is nearest the thigh-bone; and in the ham, the popliteal vein is behind the artery, and consequently more superficial.

SECTION VI.

OF THE NERVES ON THE FRONT OF THE THIGH.

The Nerves of the Lower Extremity are derived from that part of the medulla spinalis which is situated in the lower dorsal and the upper lumbar vertebræ. The lumbar nerves form a plexus behind the psoas magnus muscle, from which proceeds a cluster of nerves to supply the front part of the lower extremity, including both its skin and muscles. The sacral nerves form a plexus in the pelvis, at the side of the rectum, from which proceeds the largest nerve in the body, the SCIATIC, appropriated to the supply of the skin and muscles on the back part of the lower extremity. The lower part of the lumbar plexus is continued into the upper of the sciatic or sacral, so that, under a more general classification than what is adopted, both of these plexuses may be considered as forming but one.

The PLEXUS LUMBALIS is seen by dissecting the psoas magnus muscle from its origin, and turning it aside; the primitive nerves, constituting this plexus, sometimes pass through the substance of the muscle, instead of going behind it. The plexus is formed by the four upper lumbar nerves, with a filament from the last dorsal. The anterior branches only of these nerves are concerned in forming it, as the posterior branches all go to the muscles of the back.

In the distribution of this plexus to the lower extremity, it will be seen, shortly after the commencement of the dissection, as we trace them from above downwards, that its branches may be considered under two divisions; first, such as go to the skin, and secondly, such as go to the muscles.

From the upper part of the plexus, fibrillæ pass outwards and downwards over the quadratus muscle. Some of their ramuscles are spent on the sides of the abdominal muscles; others wind over the crista of the ilium about its middle part, and are distributed to the integuments of the hip.

1. The NERVUS SPERMATICUS EXTERNUS, arising from the upper part of this plexus, crosses the iliacus internus muscle, and shapes its course towards the anterior-superior spinous process of the ilium. Here it involves itself in the edge of the abdominal muscles, and, going on the posterior face of Poupart's ligament, at the internal ab-

dominal ring, joins the spermatic cord of the male, or the round ligament of the uterus of the female. In the first case it is distributed to the spermatic cord and scrotum; in the second, to the labium externum and mons veneris.

2. The CUTANEUS EXTERNUS arises from the lumbar plexus, below the external spermatic. It passes across the iliacus internus towards the anterior-superior spinous process, about an inch below the spermaticus externus, and crosses the latter nerve just at that process. Emerging from the abdomen, by penetrating the commencement of Poupart's ligament, it is distributed, in several branches, to the integuments of the vastus externus muscle, and along the edge of the rectus femoris; one of the latter extends to the patella.

3. The CUTANEUS MEDIUS is given from the anterior crural, an inch or so above Poupart's ligament, coming from it among the cluster of branches which arise there to be distributed to the iliacus internus muscle, and to the muscles of the thigh. It appears superficially on the thigh for the first time, by penetrating the sartorius muscle, about the internal edge of the rectus femoris; it descends then along the same edge of the latter muscle, and is distributed to its integuments. It does not descend so low as the other nerve.

4. The CUTANEUS ANTERIOR arises also from the crural nerve; it is on the inner side of the cutaneus medius, emerges from the fascia of the thigh, and crosses the sartorius muscle two or three inches below the cutaneus medius. It is distributed on the integuments of the vastus internus muscle, and some of its branches extend to the internal edge of the patella.

5. The CUTANEUS INTERNUS arises from the anterior crural nerve, among the same cluster, above Poupart's ligament. It divides into four or five branches of different lengths, and is distributed to the integuments of the adductor muscles and along the inner front side of the

thigh. One branch observes very much the course of the tendon of the adductor magnus, and reaches as far down as the inner side of the knee.

The Cruralis Anterior arises from the middle of the lumbar plexus; at first, it is beneath the psoas magnus muscle; it then gets to its outside, and passes from the abdomen, under Poupart's ligament, about half an inch from the exterior margin of the femoral artery. Before it reaches Poupart's ligament, it gives off a cluster of nerves, several of which go to the iliacus internus muscle, others form the superficial or cutaneous nerves of the thigh, and others the deep-seated or muscular branches. The distribution of the cutaneous nerves has just been mentioned; the muscular ones supply the adductor muscles, the four extensors, the pectineus, the sartorius, and the gracilis.

One of the branches of the anterior crural nerve is seen to accompany the femoral artery till the artery penetrates the adductor magnus; it then runs along the front margin of the tendon of the adductor magnus, in a channel formed by this tendon, and the origin of the vastus internus. The nerve alluded to is the Saphenus. It passes afterwards between the internal condyle of the os femoris and the sartorius muscle, attaches itself to the saphena vein, and is distributed to the integuments of the inner side of the leg and of the upper internal parts of the foot.

The Nervus Obturatorius is derived from the middle of the lumbar plexus, also, and has very much the same position in regard to the psoas magnus as the anterior crural nerve. It descends from beneath the psoas magnus into the pelvis, near the sacro-iliac joint, and passes forwards and downwards to the obturator foramen, having got through which it divides into an anterior and a posterior branch.

The first is distributed to the heads of the adductor longus and brevis, to the gracilis, and to the integuments.

The second terminates in the obturator externus and the adductor magnus.

The subject should now be turned over, in order to enable us to study the muscles and nerves on the back of the limb.

SECTION VII.

MUSCLES ON THE BACK OF THE THIGH.

The Gluteus Magnus arises fleshy from the posterior third or fourth of the spine of the ilium and the adjoining flat surface of the bone, from the side of the sacrum below it, from the side of the os coccygis, and from the posterior surface of the large sacro-sciatic ligament. The fibres of this muscle are collected into large fasciculi, with deep interstices between them, and the lower edge of it is folded over the posterior sacro-sciatic ligament.

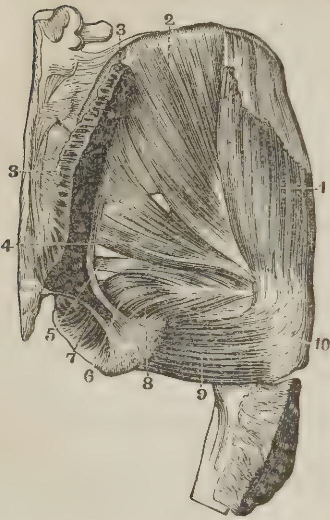
Its fibres pass obliquely forwards and downwards, and terminate in a thick broad tendon, the upper part of which goes on the outside of the trochanter major, and is very strongly inserted into the fascia femoris, while the lower part is inserted into the upper third of the linea aspera, going down as far as the origin of the short head of the biceps flexor cruris.

This muscle is placed immediately under the skin, the fasciculi being separated to some depth by processes from the fascia femoris. It covers nearly all the other muscles on the back part of the pelvis, laps over its inferior margin laterally, and conceals the origins of the hamstring muscles. There is a very large bursa placed between the tendon of this muscle and the external face of the trochanter major; another of almost equal magnitude between it, the superior extremity of the vastus externus, and the inferior end of the tensor vaginæ femoris, and there are two smaller ones between the same tendon and the os femoris, which are placed lower and more posteriorly. It draws the thigh backwards and assists in keeping the spine erect.

The Gluteus Medius arises from the whole length of the crista of the ilium, except its posterior third, and from

Fig. 142.

A View of the Muscles on the Back of the Hip.



1, 2. Gluteus Medius.
3. Cut Origin of Gluteus Maximus.
4. Pyriformis.
5, 8, 10. Gemelli.
6, 7. Obturator Internus.
9. Quadratus Femoris.

that part of the dorsum of the bone which is between its crista and the semicircular ridge, extending from the anterior-superior spinous process to the sciatic notch; also from the lunated edge of the os ilium between the anterior-superior and anterior-inferior spinous processes, and largely from that part of the inner face of the fascia femoris which covers this muscle.

The anterior-superior part of this muscle is not covered by the gluteus magnus, but lies before it. Its fibres converge, and are inserted by a broad thick tendon into the upper surface of the trochanter major, and into the upper anterior part of the shaft of the bone, just in front of the same trochanter.

It draws the thigh backwards and outwards.

A bursa is interposed between the extremity of its tendon and the tendinous insertion of the small rotator muscles.

The Gluteus Minimus arises from that part of the dorsum of the ilium, between the semicircular ridge just spoken of, and the margin of the capsular ligament of the hip-joint. It is entirely concealed by the gluteus medius.

Its fibres converge and terminate in a round tendon, which is inserted into the anterior and superior part of the trochanter major, just within the anterior insertion of the gluteus medius.

Fig. 143.

A VIEW OF THE GLUTEUS MINIMUS MUSCLE.

It adducts the thigh, and can also rotate the limb inwards.

A bursa of small size exists between its tendon and the trochanter major.

There are several small muscles about the hip-joint, the most of which can be seen by the removal of the gluteus magnus.

The PYRIFORMIS (see Fig. 142) arises fleshy and tendinous, within the pelvis, from the anterior face of the second, third, and fourth bones of the sacrum. It forms a conical belly, which passes out of the pelvis at the upper part of the sacro-sciatic foramen, receiving a slip of fibres from the posterior-inferior spinous process of the ilium.

It is inserted by a round tendon, into the upper middle part of the trochanter major within the insertion of the gluteus medius.

It rotates the limb outwards.

Between its tendon and the superior germinus, a small bursa exists.

The GEMINI are two small muscles closely connected with each other, which are situated lower down on the limb than the pyriformis. The upper one arises from the posterior part of the root of the spinous process of the ischium; the lower from the upper back part of the tuberosity of the ischium.

Being parallel to each other, and connected by their contiguous edges, they are inserted together into the posterior part of the thigh-bone, at the root of the trochanter major, where the rough pit is.

They also rotate the limb outwards.

The OBTURATOR INTERNUS muscle is principally situated within the cavity of the pelvis. It arises, fleshy, from all the margin of the foramen thyroideum except where the obturator vessels go out, and from the posterior face of the ligamentous membrane stretched across it; also from the upper part of the plane of the ischium just below the linea innominata. Its fibres converge, and, forming a tendon, pass out of the pelvis over the trochlea of the ischium, between the sacro-sciatic ligaments.

The tendon is placed between the gemini muscles, which form a sheath for it, and is inserted into the pit on the back of the os femoris, at the root of the trochanter major.

Between the tendon of this muscle and the gemini is a long bursa; and a second is found where the muscle plays over the ischium.

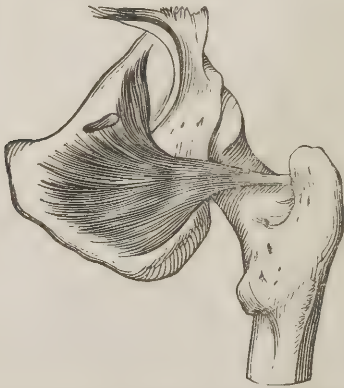
It rotates the limb outwards.

The QUADRATUS FEMORIS is lower down than the other muscles. It arises, tendinous and fleshy, from the ridge on the outer side of the ischium, which constitutes the exterior boundary of the tuberosity.

Its fibres are transverse, and are inserted, fleshy, into the rough ridge of the os femoris on its back part, which goes from one trochanter to the other.

It rotates the limb outwards. A bursa exists between it and the trochanter minor.

Fig. 144.



A View of the Obturator Externus Muscle.

The Obturator Externus is concealed in front by the pectineus and triceps adductor, and behind by the quadratus femoris; to get a satisfactory view of it, therefore, these muscles should be detached from the bone. It arises from the whole anterior circumference of the foramen thyroideum, excepting the place where the obturator vessels come out, and from the anterior face of the ligamentous membrane stretched across it.

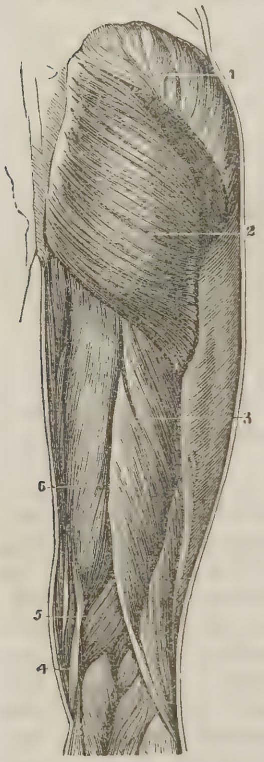
The fibres of this muscle converge, pass beneath the capsular ligament of the hip-joint adhering to it, and terminate successively in a round tendon, which is inserted into the inferior part of the cavity on the posterior surface of the os femoris, at the root of the trochanter major. The course of the tendon of this muscle is marked on the neck of the thigh-bone, by a superficial fossa.

It rotates the thigh outwards.

The Biceps Flexor Cruris constitutes the outer hamstring, and is situated on the posterior outer part of the thigh; it arises by two heads. The first, called the long head, has an origin in common with the semi-tendinosus, from the upper back part of the tuberosity of the ischium

Fig. 145.

A View of the Principal Muscles of the Back of the Thigh.



1. Gluteus Medius.
2. Gluteus Maximus.
3. Biceps Flexor Cruris.
4. Tendon of Semi-tendinosus.
5. Semi-membranosus muscle.
6. Semi-tendinosus muscle.

by a short tendon, which, in its descent, is changed into a thick fleshy belly. The other, called the short head, arises, by an acute fleshy beginning, from the linea aspera, just below the insertion of the gluteus magnus, and is continued along the lower part of the linea aspera, from the ridge leading to the external condyle.

A thick tendon is gradually formed on the outside of the muscle, which descending along the external face of the external condyle, is inserted into the upper part of the head of the fibula.

A bursa is found between this tendon and the external lateral ligament of the knee.

This muscle flexes the leg on the thigh.

The SEMI-TENDINOSUS is on the inside of the thigh, between the biceps and gracilis. It is superficial, being immediately under the fascia, and arises, in common with the biceps, from the back part of the tuberosity of the ischium; it also adheres, for three or four inches, to the inner edge of the tendon of this the long head of the biceps.

About four inches above the knee it terminates in a long round tendon, which passes behind the internal condyle and the head of the tibia, and is reflected forwards, to be inserted into the side of the tibia, just below its tubercle and very near it, being lower down than the insertion of the tendon of the gracilis. Between its origin, that of the long head of the biceps and the semi-membranosus, there is a bursa; one or more are likewise found between its tendon, below that of the sartorius, of the gracilis, and the internal ligament of the knee.

It flexes the leg on the thigh.

The SEMI-MEMBRANOSUS is at the inner side of the thigh; its upper part is concealed by the semi-tendinosus and the origin of the long head of the biceps, and below, it projects between these two muscles. It is in contact with the posterior surface of the adductor magnus.

It arises, by a thick round tendon, from the exterior upper part of the tuberosity of the ischium, which tendon soon becomes flattened and sends off the muscular fibres obliquely from its exterior edge, to a corresponding tendon below. The latter, passing behind the internal condyle and the head of the tibia, detaches a thin aponeurotic membrane under the inner head of the gastrocnemius, to cover the posterior part of the capsule of the knee-joint, and to be fastened to the external condyle.

It is inserted, by a round tendon, into the inner and back part of the head of the tibia just below the joint. The unfavorable insertion of this muscle is compensated by the course of its fibres, which gives it great increase of strength. A bursa exists between its tendon above and the quadratus; another exists between its tendinous termination, the internal head of the gastrocnemius and the capsule of the knee.

It flexes the leg on the thigh.

Whilst dissecting these muscles, attention may also be given to the adjacent vessels.

SECTION VIII.

ARTERIES SEEN ON THE BACK OF THE THIGH.

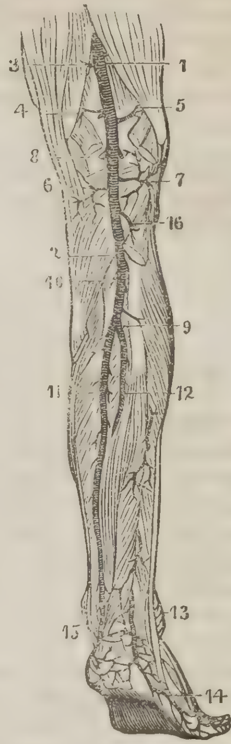
The Popliteal Artery (Arteria Poplitea) is the continuation of the femoral after the latter has passed through the adductor tendon, and got to the back of the lower extremity, and extends from this point to the opening in the interosseous ligament of the leg, just below the heads of the bones. Its first act is to cross obliquely the os femoris as far as its middle; it then passes in a vertical line downwards, very nearly over the centre of the os femoris, knee-joint, and head of the tibia, being only separated from these parts in consequence of a thick envelop of fat, which fills up the hollow of the ham, and protects the artery from the effects of sudden flexions of the part, and of bruises. The Popliteal Artery sends off the following branches:—

1. The Superior Internal Articular Artery (Articularis Superior Interna) sometimes exists as two trunks; it arises just above the internal condyle, perforates the adductor tendon, and, going horizontally, is spent on the inner side of the joint above.

2. The Superior External Articular Artery (Articularis Superior Externa) arises just above the external condyle, passes horizontally between the femur and the biceps flexor, and is distributed to the upper external parts of the joint.

Fig. 146.

Arteries on the Back of the Thigh, Leg, and Foot.



1, 2. Popliteal Artery.
3. Anastomotic Artery, the Last Branch of the Femoral.
4. Superior Internal Articular Artery.
5. Superior External Articular Artery.
6. Inferior Internal Articular.
7. Azygos Artery.
8. Sural or Gastrocnemial Arteries.
2. Point at which the Popliteal divides into the Anterior and Posterior Tibial Arteries.
9. Point at which the Posterior Tibial gives off the Peroneal Artery; being called thus far the Tibio-Peroneal Artery.
10. Nutritious Artery of the Tibia.
11. Continued Trunk of the Posterior Tibial Artery.
12. Peroneal Artery.
13. External Malleolar Artery.
14. External Plantar Artery.
15. Internal Malleolar Artery.
16. Inferior External Articular Artery.

3. The Middle Articular (Articularis Media) sometimes comes from one of the others; it is distributed to the posterior middle parts of the knee-joint.

4. The Inferior Internal Articular Artery (Articularis Inferior Interna) arises on a level with the inferior part of the internal condyle. It descends obliquely, passes between the lateral ligament and the head of the tibia, and then mounts towards the patella, to be distributed in numerous branches.

5. The Inferior External Articular Artery (Articularis Inferior Externa) arises near the last, and sometimes they are derived from a common trunk. It passes between the external lateral ligament and the head of the tibia, mounts afterwards towards the patella, and is then minutely ramified on the lower external parts of the knee-joint.

The upper articular arteries anastomose with the lower, and also with the anastomotic and the long branch of the external circumflex.

SECTION IX.

NERVES SEEN ON THE BACK OF THE THIGH.

The nerves of this region are as follows:—

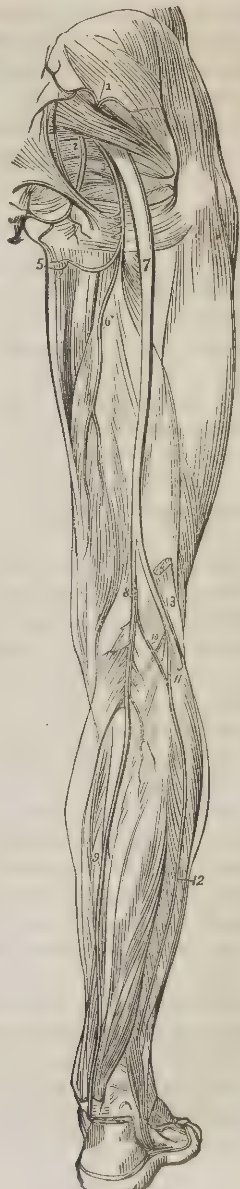
The Sciatic Plexus (Plexus Ischiadicus) is formed by the union of the last lumbar with the four upper sacral nerves; the last lumbar, before it joins the plexus, receives the branch of the fourth lumbar nerve, which is left after the lumbar plexus is formed. This plexus is situated at the side of the rectum, before the pyriformis muscle.

The sacral nerves amount to six in number, sometimes only to five. They arise from the lower part of the cauda equina, and pass in a very oblique direction in order to arrive at the sacral foramina. Like the other nerves of the spine, they form ganglions by the union of their anterior and posterior fasciculi, and then pass outwards from the spinal canal, each one by an anterior branch which goes through the foramen in front of the sacrum, and a posterior branch much smaller, which gets through the foramen on the back of the sacrum. The volume of the posterior branches increases till the fourth, but the fifth and the sixth are much smaller, in fact, only fibrillæ. These posterior branches all communicate with each other, being distributed to the head of the sacro-lumbalis and longissimus dorsi, to the posterior edge of the glutæus magnus, to the integuments of the buttock, margin of the anus, and to the internal parts of the thigh.

The anterior branches of the sacral nerves are much

Fig. 147.

A VIEW OF THE GREATER AND LESSER SCIATIC NERVES IN THEIR ENTIRE COURSE DOWN THE LIMB.



1. Superior Gluteal Nerve.
2. Pudic Nerves.
3. Lesser Sciatic Nerve.
5. Inferior Pudendal Branch.
6. Continuation of the Small Sciatic.
7. Greater Sciatic Nerve.
8, 9. Popliteal and Posterior Tibial Nerve.
10, 12. Short Saphenus Nerve.
11. Peroneal Communicating Branch.
13. Peroneal Nerve.

larger than the posterior. The first four communicate with the sacral ganglions of the great sympathetic, besides forming the Ischiatic plexus. The third and the fourth, assisted by the sympathetic, form the Hypogastric plexus. The fifth and the sixth, when it exists, are distributed to the coccygeus, sphincter, and levator ani.*

The following small branches are sent from the Sciatic plexus.†

a. Nervi Glutæi, one passing through the upper part of the sciatic notch along with the artery, to the glutæus medius and minimus, the other, below the pyriformis muscle, to the glutæus magnus.

b. Nervus Pudendalis Longus Inferior, which passes under the tuber of the ischium to the glutæus magnus, perineal muscles, urethra, and integuments of the penis, and scrotum in men, and to the inferior parts of the labia externa in women.

c. Ramus Femoralis Cutaneus Posterior. This nerve is placed between the integuments of the thigh and the muscles which arise from the tuberosity of the ischium. It sends many branches successively to the skin on the back of the thigh; one of its branches is longer than the others, goes down to the ham, and there divides into several filaments which are distributed to the integuments on the back of the leg.

The Nervus Pudendalis Superior comes from the third and fourth sacral, occasionally receiving a contribution from the small sciatic, when it exists. It goes in company with the internal pudic artery between the sacro-sciatic ligaments, and then divides into two branches; the inferior of which is distributed to the integuments and

* This is only given as the most frequent arrangement of the Sciatic plexus, and of the branches of nerves which proceed from it; other arrangements will often be met with in the cavity of the pelvis, in which not so many sacral nerves are sent to the plexus, and the several branches proceeding from it depart in a different manner.

† They sometimes come from a common trunk called the Small Sciatic.

muscles of the perineum, to the urethra and scrotum; the superior passing along the ramus of the ischium and pubes with the trunk of the internal pudic artery, is distributed to the obturator internus, accelerator urinæ, urethra, and afterwards getting between the symphysis of the pubes and the penis, terminates on its integuments and the glans penis.

The Nervus Ischiadicus, or the Great Sciatic, is the common trunk formed from the sciatic plexus; it is much the largest nerve in the body, and passes from the pelvis between the pyriformis and the geminus superior muscles. It crosses vertically behind the small rotator muscles of the thigh, being concealed by the inferior edge of the glutæus magnus; it is there about half-way between the tuberosity of the ischium and trochanter major. Thence it descends on the back of the adductor magnus at the outer edge of the long head of the biceps flexor cruris. About half-way down the thigh, sometimes a little lower, the Sciatic nerve divides into the Popliteal or Posterior Tibial and Peroneal nerves. Occasionally, this division takes place as high as the exit of the nerve from the pelvis, but, in this case, the fasciculi are parallel with each other as far as the middle of the thigh. From the trochanter minor to its usúal place of division, this nerve is parallel with, and on the back of the thigh-bone, but there the two branches begin to diverge. The Popliteal nerve continues straight downwards to the back and middle of the knee-joint, and to the interstice between the heads of the gastrocnemius muscle, whereas the fibular nerve goes along the inner posterior edge of the biceps flexor cruris, and passes between its tendinous insertion and the external head of the gastrocnemius muscle (see Fig. 147).

In this course the following branches are sent from the Sciatic: Twigs to the little rotator muscles of the thigh. The Cutaneus Internus Superior, which arises near the upper part of the thigh, and is distributed to the skin of the corresponding part. The Cutaneus Internus Inferior, which arises just below the last, and descends upon the inner head of the gastrocnemius muscle, is distributed to the integuments of the calf of the leg. A large trunk, and sometimes instead of it distinct branches, go to the Adductor Magnus, Semi-membranosus, Biceps, and Semi-tendinosus.

SECTION X.

OF THE SUPERFICIAL PARTS OF THE LEG.

[In dissecting the leg, an incision should be made through the integuments, by commencing below the patella, and continuing it over the spine of the tibia and dorsum of the foot, until it reaches a line corresponding with the base of the first phalanges of the toes. A transverse incision, extending from the outer to the inner side of the foot, being then made, and the skin turned off outwards and inwards, a similar dissection of the superficial fascia may follow.

Beneath the skin on the outer part of the limb, at its lower third, two nerves will now be seen piercing the deep fascia, and running downward on the superficial fascia to the dorsum of the foot. These nerves are called the peroneal cutaneous, and are distributed to all the toes, the external one supplying three toes, the internal one the great toe, and half the second.

On the inner side of the limb, upon the malleolus, a vein of considerable size will also be seen, which originates by numerous small branches from the inner side of the dorsum of the foot. This is the Saphena Interna Vein. (See Fig. 133.) It runs up the internal side of the leg, behind the condyle of the femur, emptying into the femoral vein at the saphenous opening in the fascia lata femoris. Accompanying this vein along the leg we may next notice the internal saphenous nerve, which, crossing over the internal malleolus, overlays the branches of the internal saphena vein, and is distributed to the inner side of the foot and great toe, communicating with the internal branch of the peroneo-cutaneus nerve. Near the head of the tibia, an artery will also be seen piercing the deep fascia, and turning upward, which is the tibial recurrent artery. The deep fascia is firmly attached to the tibia and fibula, and between the internal and external malleolar processes and the anterior annular ligament, forms a strong band, which serves to bind down the extensor tendons of the foot.

The course and relations of the saphena interna vein and nerve should be particularly studied in this stage of the dissection, as this vein is frequently selected for the operation of bloodletting. The nerve will be seen to be on the inner side of the vein until after its passage over the internal malleolus, when it sends a number of branches over the vein, so that the proper place to open the vein would be a little above the malleolus and on the outer side of its trunk. The close continuity of the vein and nerve along the whole length of the leg should therefore be remembered in all operations upon this vessel.—A.]

SECTION XI.

MUSCLES OF THE LEG.

The muscles of the leg are to be found on its anterior, posterior, and external faces.

§ 1. MUSCLES ON THE FRONT OF THE LEG.

The TIBIALIS ANTICUS muscle is situated superficially under the fascia of the leg, at the outside of the spine of the tibia, and in front of the interosseous ligament. It arises fleshy from the head, outer surface, and spine of the tibia, and from the interosseous ligament, to within three or four inches of the ankle. It also arises by its front surface from the internal face of the fascia of the leg.

A rounded long tendon is formed below, into which the fleshy fibres run obliquely, and which, passing through a distinct noose of the annular ligament in front of the malleolus internus, crosses the astragalus and os naviculare, and is inserted on the inner side of the sole of the foot, into the anterior part of the base of the cuneiforme internum, and into the adjacent part of the metatarsal bone of the great toe.

A bursa surrounds the tendon where it passes beneath the annular ligament; another exists at its lower part.

This muscle corresponds with the radial extensors of the arm.

It bends the foot, and presents the sole obliquely inwards.

The Extensor Longus Digitorum Pedis is also superficially placed just under the fascia of the leg and in front of the fibula, being in contact above with the tibialis anticus, and below with the extensor proprius pollicis. It arises, tendinous and fleshy, from the outer part of the head of the tibia, from the head of the fibula, and almost the whole length of its anterior angle; also from the upper part of the interosseous ligament and the internal face of the fascia of the leg. Its fibres go obliquely downwards and forwards to the tendon, which begins not far from its upper end and descends along its anterior margin.

About the middle of the leg the tendon splits into four, which are confined by the annular ligament of the ankle, and then diverging, are inserted respectively into the base of each toe, except the big one, and expanded over its back part as far as the last phalanx.

A long bursa is found enveloping the tendons, where they pass beneath the annular ligament of the ankle.

It extends all the joints of the small toes and flexes the foot.

The Peroneus Tertius is rather a portion of the extensor longus; is found at its lower outer part, and cannot be naturally separated from it. It arises from the anterior angle of the fibula, between its middle and lower end.

It is inserted, by a flattened tendon, into the base of the metatarsal bone of the little toe, and assists in bending the foot.

The Extensor Proprius Pollicis Pedis is between the lower part of the tibialis anticus and the extensor longus. It arises from the fibula between its anterior and internal angles, by a tendinous and fleshy origin, which, commencing about four inches below the head of the fibula, continues almost to its inferior extremity. A few fibres also come from the interosseous ligament, and from the lower part of the tibia.

The muscle being half penniform, the fibres run at its forepart obliquely to a tendon which passes through a particular gutter of the annular ligament, and over the astragalus, scaphoides, and upper internal parts of the foot, to be inserted into the base of the first and second phalanx of the great toe.

A bursa invests this tendon where it passes beneath the annular ligament.

It extends, as its name implies, the great toe.

Fig. 148.

A Side View of the Muscles of the Leg and Foot.

1. Biceps Flexor Cruris.
2. Vastus Externus.
3, 3. Gastrocnemius.
4. Soleus.
5. Tendo Achillis.
6. Tibialis Anticus.
7. Extensor Longus Digitorum Pedis.
8. Extensor Proprius Pollicis.
9. Peroneus Tertius.
10. Peroneus Longus.
11. Peroneus Brevis.
12, 12. Abductor Minimi Digiti.
13. Extensor Brevis Digitorum.
14. Interosseus Dorsalis.

On the outside of the leg, between the fibula and fascia, are the two Peronei muscles.

The Peroneus Longus seu Primus arises, tendinous and fleshy, from the fore and outside of the head of the fibula, from the space on its outer side above, between the external and anterior angles; also from its external angle to within a short distance of the ankle.

A flattened thick tendon, to which the fibres pass obliquely, constitutes the outer face of the muscle. This tendon is lodged in the groove at the posterior part of the malleolus externus, being confined to it by a thick ligamentous noose, and furnished there with a bursa. It then traverses the outer side of the os calcis, where its passage is marked by a superficial sulcus, runs through the groove of the os cuboides, where there is another bursa, and, lying deep in the sole of the foot covered by the calcaneo-cuboid ligament and next to the tarsal bones, it is inserted into the base of the internal cuneiform bone, and into the adjacent part of the metatarsal bone of the great toe.

It extends the foot and inclines the sole obliquely outwards, corresponding with the flexor carpi ulnaris of the forearm. Small sesamoid bones are occasionally found where the tendon winds round the os cuboides.

The PERONEUS BREVIS seu SECUNDUS is concealed in a great degree by the peroneous longus, being situated between the latter and the extensor longus digitorum. It arises, tendinous and fleshy, from the outer surface of the fibula, commencing about one-third of the length of the bone from its head, and continuing almost to the ankle.

A tendinous facing exists externally also in this muscle, to which its fibres proceed obliquely. This tendon is continued through the fossa at the back part of the malleolus externus, being covered by the tendon of the peroneus longus, and, confined by the same ligamentous noose, and passing through the superficial fossa at the outer side of the os calcis, is inserted into the external part of the base of the metatarsal bone of the little toe. It extends the foot and presents the sole obliquely downwards. It corresponds with the flexor carpi ulnaris.

§ 2. MUSCLES ON THE BACK OF THE LEG.

The TRICEPS SURÆ is placed on the back of the leg, and constitutes its calf. It consists of the Gastrocnemius and Soleus, which in fact form but one muscle.

The GASTROCNEMIUS is the most superficial, and conceals the other in consequence of its breadth. It arises from the condyles of the os femoris by two heads. One head arises, tendinous, from the upper back part of the internal condyle, and fleshy, from the adjacent part of the ridge leading to the linea aspera; the other head arises, by a broad tendon in the same way, from the external condyle and the ridge above it. A triangular vacancy is left between the heads of the muscle, for the passage of the popliteal vessels; they then join together, but in such a way that the appearance of two bellies is

Fig. 149.

The Superficial Muscles of the Posterior Face of the Leg.

1. The Biceps Muscle forming the Outer Hamstring.
2. The Tendons forming the Inner Hamstring.
3. The Popliteal Space.
4. The Gastrocnemius Muscle.
5. The Soleus.
6. Tendo Achillis.
7. The Posterior Tuberosity of the Os Calcis.
8. The Tendons of the Peroneus Longus and Brevis Muscles passing behind the outer ankle.
9. The Tendons of the Tibialis Posticus and Flexor Longus Digitorum Pedis passing into the foot behind the inner ankle.

distinctly preserved, of which the internal is the largest. The muscular fibres pass from a broad tendinous facing on the back to a corresponding one on the front surface of the muscle, from the latter of which comes the Tendo Achillis.

The heads of the gastrocnemius being detached from their origin, we then see the Soleus.

The Soleus arises fleshy from the posterior part of the head of the fibula, and from the external angle of that bone for two-thirds of its length down, behind the peroneus longus. It also arises, fleshy, from the oblique ridge on the posterior surface of the tibia, just at the lower edge of the popliteus muscle, and from the internal angle of the tibia for four or five inches. The two heads are separated for the passage of the posterior tibial vessels.

The body of this muscle has a great intermixture of tendinous matter in it, and from its lower extremity proceeds the other origin of the Tendo Achillis; about three or four inches above the heel, this tendon joins the anterior face of the tendon of the gastrocnemius, and by the union of the two is formed the Tendo Achillis, which is inserted into the posterior inferior surface of the os calcis near its tuberosities.

These two muscles extend the foot, and are all-important in walking. A bursa is between these tendons and the os calcis.

The Plantaris is a singular little muscle concealed by the gastrocnemius, and has a short fleshy belly, and a long tendon. It arises, fleshy, from the ridge of the os femoris just above the external condyle; passes across the capsular ligament of the joint, adhering to it in its course, and the belly terminates somewhat below the head of the tibia in a long delicate tendon, which descends between the inner head of the soleus and the gastrocnemius.

At the place where these tendons unite, the tendon of the plantaris emerges from between them, and running at the inner edge of the tendo Achillis, is inserted into the inside of the os calcis just before the insertion of the tendo Achillis.

It extends the foot, but contributes so little to its motions, and in other respects is of such doubtful use, that its proper function is uncertain.

The POPLITEUS is a triangular muscle on the back of the knee-joint. It arises from a deep depression on the exterior face of the external condyle, by a thick round tendon, which passes through the capsular ligament, being connected with the external semilunar cartilage, and then forms a fleshy belly that passes obliquely inwards and downwards.

It is inserted, fleshy, into the oblique ridge on the back of the tibia just below its head, and into the triangular depression above it.

A bursa exists between its origin and the capsular ligament; and its tendon is in contact with the synovial membrane of the joint.

It bends the leg, and when bent, rotates it inwards.

By removing the Soleus we expose three other muscles on the back of the leg, the Tibialis Posticus, the Flexor Longus Digitorum Pedis, and the Flexor Longus Pollicis Pedis. These muscles are covered by a thick strong fascia, from which some of their fibres originate, and which should be removed.

The FLEXOR LONGUS DIGITORUM PEDIS PERFORANS is behind the tibia, and at the inner edge of the tibialis posticus. It arises, by an acute, tendinous, and fleshy beginning, from the back of the tibia, a little below the popliteus muscle, its origin being continued from the internal angle of the tibia, almost to the ankle-joint. It arises, also by tendinous and fleshy fibres, from the outer edge of the tibia, just above its connection with the fibula at the ankle; the latter origin is, however, frequently deficient; and between this double order of fibres, the tibialis posticus lies.

The fibres pass obliquely into a tendon at the posterior edge of the muscle, which runs in the groove behind the internal malleolus, and is confined there by a strong ligamentous sheath, being placed behind and within the tendon of the tibialis posticus. The tendon then gets to the sole of the foot along the sinuosity of the os calcis, and being joined by a considerable tendon, detached from the flexor longus pollicis, it divides into four branches, which are appropriated to the four small toes.

Fig. 150.

DEEP MUSCLES ON THE BACK OF THE LEG.

1. The Lower Extremity of the Femur.
2. Ligament of Winslow.
3. Tendon of the Semimembranous Muscle.
4. Internal Lateral Ligament of the Knee-Joint.
5. External Lateral Ligament.
6. Popliteus Muscle.
7. Flexor Longus Digitorum Pedis.
8. Tibialis Posticus Muscle.
9. Flexor Longus Proprius Pollicis Pedis.
10. Peroneus Longus Muscle.
11. Peroneus Brevis.
12. Tendo Achillis divided near its Insertion.
13. Tendons of the Tibialis Posticus and Flexor Longus Digitorum Pedis, just as they are about to pass beneath the Internal Annular Ligament. The interval between the latter Tendon and the Tendon of the Flexor Longus Pollicis is occupied by the Posterior Tibial Vessels and Nerve.

These tendons are inserted into the bases of the third phalanges of the lesser toes, are very near the tarsal bones, and from perforating the tendons of the flexor brevis, correspond with the flexor perforans of the hand.

A bursa exists where the tendon passes along the tibia and the os calcis; and another is found in the sole of the foot, enveloping this tendon and that of the flexor longus pollicis. A fifth tendon is sometimes observed, which splits and goes to the second bone of the small toe; this occurs when the latter is not supplied from the flexor brevis.

This muscle flexes the small toes and extends the foot.

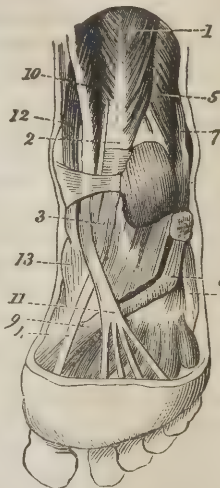
Fig. 151.

TENDONS SEEN IN THE SOLE OF THE FOOT.

1. Flexor Longus Proprius Pollicis.
2. Point where its Tendon enters its Sheath, under the Arch of the Os Calcis.

3, 4. Its course under the Plantar Arch to the Great Toe.

5. Peroneus Brevis.
6. Insertion of its Tendon into the Fifth Metatarsal Bone.
7. Tendon of the Peroneus Longus, passing under the Outer Ankle.
8. Angle formed by the latter Tendon on the Facet of the Os Cuboides.
9. Its Attachment to the Head of the first Metatarsal Bone.
10. Flexor Longus Digitorum Pedis.
11. Division of its Tendon into Four Slips for the four Lesser Toes.
12. Tendon of the Tibialis Posticus.
13. Its Insertion into the Tuberosity of the Os Scaphoides.



The FLEXOR LONGUS POLLICIS PEDIS is a stout muscle formed of oblique fibres, situated on the back part of the fibula, and at the outer side of the tibialis posticus. It arises by an acute, tendinous, and fleshy beginning, from the posterior flat surface of the fibula, commencing about three inches from its head, and continuing almost to the ankle.

The tendon of this muscle is large and round, forms gradually, and constitutes a facing to the posterior edge of the muscle. It passes through a superficial fossa of the tibia at the back of the ankle, near its middle, and from thence through a notch in the back edge of the astragalus to the sole of the foot, where it crosses the tendon of the flexor longus digitorum, and gives off the branch just mentioned to join it, which goes principally to the second toe. This tendon is deeper seated in the foot than the other.

The tendon of the flexor longus pollicis is inserted into the second phalanx of the great toe. It bends the great toe, and from its connection with the others, will bend them also.

A bursa invests its tendon in the canal of the astragalus, and along the os calcis; another, as stated, is common to it and the flexor perforans muscle, and a third invests the tendon along the metatarsal bone, and the first phalanx of the great toe.

The TIBIALIS POSTICUS is placed between, and concealed by the last two muscles. It arises, by a narrow fleshy beginning, from the front of the tibia, at the under surface of the process which joins it to the fibula, and then gets to the back of the leg, through a hole in the interosseous ligament. It continues its origin from the whole of the interosseous ligament, and from the surfaces of the tibia and fibula, bordering on the ligament, excepting one-third of the lower part of the fibula, and rather more of the lower part of the tibia.

The fleshy fibres run obliquely to a middle tendon, which passes in the groove at the back of the malleolus internus, and is confined there by a fibro-cartilaginous noose, and invested by a bursa. It is inserted into the upper internal part of the os naviculare, or scaphoides, at its tuberosity, and also divides in such a way as to be inserted into the internal and external cuneiform bones, into the os cuboides, and os calcis.

It extends the foot, and presents the sole obliquely inwards, corresponding with the flexor radialis of the hand.

SECTION XII.

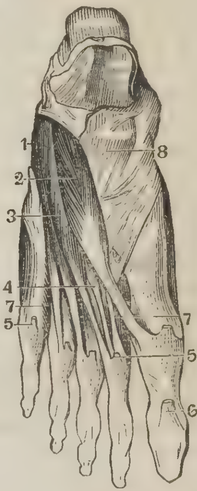
OF THE MUSCLES OF THE FOOT.

The EXTENSOR BREVIS DIGITORUM PEDIS is the only muscle on the superior surface of the foot. It is placed beneath the tendons of the extensor longus, and arises, tendinous and fleshy, from the upper forepart of the greater apophysis of the os calcis, being connected with the origin of the annular ligament of the ankle. It forms a short fleshy belly, which is partially divided into four parts; from these bellies proceed as many tendons, which crossing very obliquely the tendons of the extensor longus, are inserted into the great toe and the three next toes, by joining with the tendons of the extensor longus, which are spread over their backs.

The tendon going to the great toe has its principal insertion into the first phalanx. It extends the toes.

Fig. 152.

Muscles seen on the Top of the Foot.



1, 2, 3. Extensor Brevis Digitorum Pedis.
4. Occasional Supernumerary Tendon.
5. Tendons, cut off, of the Extensor Digitorum Communis.
6. Tendon, cut off, of the Extensor Proprius Pollicis.
7. Interossei Muscles.
8. Superior Astragalo-scaphoid Ligament.

The Sole of the Foot is protected, in the first place, by an unusual thickness of its cuticle, which is increased in such parts as are most pressed upon, as the heel, and the ball of the great toe.

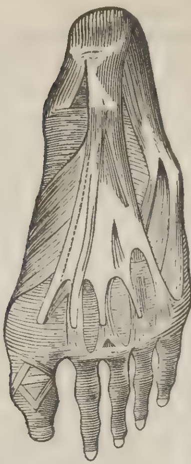
Beneath it is a thick layer of adipose matter, found in the most emaciated as well as the most corpulent subjects, which seems to be less under the influence of the causes producing a diminution or increase of fat, than the adipose matter in any other part of the body. It is collected into granulations, separated from each other by processes of condensed cellular membrane resembling ligament, that pass from the interior surface of the skin to the aponeurosis plantaris. It fills up completely all the fissures in this aponeurosis, and adheres very closely to it, so that it requires much trouble to get out a fair dissection of the aponeurosis.

The Aponeurosis, or Fascia Plantaris is a ligamentous membrane extending from the tuberosities of the os calcis to the anterior ends of the metatarsal bones. It is triangular, and corresponds with the outline of the foot, by being narrow behind and broad before. It is divided into three parts, according to the division of the muscles of the foot, one part lying on the muscles at the outside of the sole, another on the muscles at the inside of the sole, and the third being between the other two. The internal and external portions are thin and reticulated; they extend from the tuberosities of the os calcis to the roots of the internal and external metatarsal bones, and are scarcely seen beyond them. But the central portion is remarkably strong near the heel, and diminishes in thickness as it spreads out. Anteriorly, it is divided into five portions, one for each metatarsal bone; each of these portions is bifurcated, and dips down to be inserted on either side of the metatarsal bone near its head and into the bases of the first phalanges of the toes. Between the prongs of each bifurcation pass the tendons, nerves, &c., to the toes. The interior face of this membrane affords origin to many of the muscular fibres, and from it proceed vertical partitions, separating the muscles of the middle of the foot from such as are on each side of it.

When the Aponeurosis Plantaris is removed, we see three muscles; the middle one under the large central portion of the aponeurosis is the Flexor Brevis Digitorum Pedis, the outer is the Abductor Minimi Digiti, and the inner the Abductor Pollicis Pedis.

The Flexor Brevis Digitorum Pedis arises fleshy, from the large tuberosity of the os calcis by a narrow

Fig. 153.



A View of the Plantar Fascia.

beginning, also from the interior surface of the aponeurosis, and the tendinous septa between it, and the contiguous muscles.

It forms a fleshy belly, going nearly as far forwards as the middle of the metatarsal bones; there it divides into four tendons, which go to the smaller toes. These are perforated by the tendons of the flexor longus, and are inserted into the sides of the second phalanges. The tendon for the little toe is often deficient.

It bends the second joint of the toes.

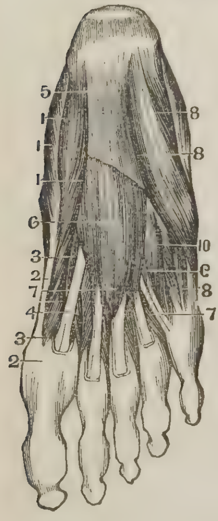
By detaching this muscle from its origin and turning it down, we bring into view the tendon of the Flexor Longus Digitorum Pedis, and its attachments behind, to the tendinous slip from the Flexor Longus Pollicis, and to the Massa Carnea Jacobi Sylvii, or Flexor Accessorius, and before to the Lumbricales muscles.

The Flexor Accessorius is at the outside of the tendon of the flexor longus digitorum pedis. It arises, fleshy, from the inside of the sinuosity of the os calcis, and by a thin tendon from the outside of the bone before its posterior tuberosities.

It is inserted, fleshy, into the outside of the tendon of the flexor longus, just at its division into four tendons. Like a second hand at a rope, it assists in flexing the toes.

Fig. 154.

MUSCLES OF THE SOLE OF THE FOOT.



1. Adductor Pollicis.
2, 2. Its Tendon.
3, 3. Flexor Brevis Pollicis.
4. Tendon of Flexor Longus Pollicis.
5. Aponeurosis Plantaris, divided.
6, 7. Flexor Brevis Digitorum Pedis.
7. Lumbricales.
8. Abductor Minimi Digiti.
9. Flexor Brevis Minimi Digiti.
10. Interossei.

The LUMBRICALES PEDIS are four small tapering muscles which arise from the tendon of the flexor longus digitorum pedis, just after its division, or while it is in the act of dividing. One of them is appropriated to each lesser toe, and is inserted into the inside of its first phalanx, and into the tendinous expansion that is sent off from the extensor muscle to cover its back.

They increase the flexion of the toes and draw them inwards.

The ABDUCTOR POLLICIS PEDIS arises, tendinous and fleshy, from the internal anterior part of the large tuberosity of the os calcis, from a ligament extended from this tuberosity to the sheath of the tendon of the tibialis posticus, from the internal side of the naviculare, and from the cuneiforme internum, being a part of the aponeurosis of the sole of the foot.

It forms the internal margin of the sole of the foot, and is inserted, tendinous, into the internal sesamoid bone and into the base of the first phalanx of the great toe.

It draws the great toe from the rest.

The FLEXOR BREVIS POLLICIS PEDIS is situated immediately at the exterior edge of the abductor pollicis. It consists of two bellies, parallel with each other, but separated by the tendon of the flexor longus pollicis; one is inseparably connected with the tendon of the abductor pollicis, and the other with the adductor pollicis.

It arises, tendinous, in common with the calcaneo-cuboid ligament, from the under part of the os calcis just behind its connection with the os cuboides, and from the under part of the external cuneiform bone.

The internal belly is inserted, tendinous, into the internal sesamoid bone along with the tendon of the abductor pollicis; and the external belly is inserted, tendinous, into the external sesamoid bone along with the tendon of the adductor pollicis. Each insertion is continued on to the base of the first phalanx of the great toe.

It flexes the great toe.

The ADDUCTOR POLLICIS PEDIS is situated at the outside of the flexor brevis, and is extended obliquely across the metatarsal bones. It arises, tendinous, at the external part of the foot, from the calcaneo-cuboid ligament, and from the roots of the second, third, and fourth metatarsal bones.

It is inserted, tendinous, into the external sesamoid bone, which insertion is continued to the first phalanx of the great toe, and is closely united to the tendon of the external head of the flexor brevis pollicis.

It draws the great toe towards the others.

The ABDUCTOR MINIMI DIGITI PEDIS forms the exter-

Fig. 155.

DISSECTION OF A SECOND LAYER OF THE PLANTAR MUSCLES OF THE FOOT.

1. Tendon of Tibialis Posticus.
2. Tendon of Flexor Longus Pollicis.
3. Tendon of Flexor Longus Digitorum.
4. Point where it separates into four Tendons.
5. Points of Insertion.
6. Flexor Accessorius.
7. Calcaneo-Cuboid Ligament.
8. Lumbricales Pedis.
9. Adductor Pollicis.
10. Flexor Brevis Pollicis.
11. Tendon of Peroneus Longus.
12. Flexor Brevis Minimi Digiti.
13. Interossei Muscle.

nal margin of the sole of the foot, and is immediately beneath the aponeurosis plantaris. It arises, tendinous and fleshy, from the outer tuberosity of the os calcis, and also from the exterior part of the base of the metatarsal bone of the little toe.

It is inserted, by a round tendon, into the exterior part of the base of the first phalanx of the little toe.

It draws the little toe from the other toes.

The FLEXOR BREVIS MINIMI DIGITI PEDIS is just within the tendon of the abductor minimi digiti. It arises from the calcaneo-cuboid ligament, as extended from the tuberosity of the cuboid bone to the heads of the metatarsal bones; also from the base of the outer or fifth metatarsal bone.

It is inserted, by a tendon, into the lower part of the first phalanx of the little toe at its base, and into the head of the metatarsal bone of the same toe. It bends the little toe.

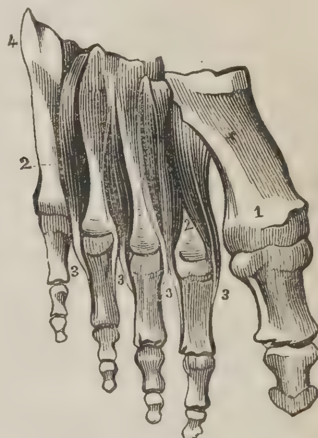
The TRANSVERSALIS PEDIS is placed beneath the tendons of the flexor muscles, the sole of the foot being upwards. It is small, and lies across the anterior extremities of the metatarsal bones. It arises, tendinous, from the capsular ligament of the first joint of the little toe; it also arises from the capsule of the first joint of the next toe.

It is inserted into the exterior face of the common tendon of the adductor and flexor brevis pollicis, at the external sesamoid bone.

It approximates the heads of the metatarsal bones.

The INTEROSSEI MUSCLES are seven in number, four of which may be seen on the upper surface of the foot.

Fig. 156.
DORSAL INTEROSSEI MUSCLES.



1. First Metatarsal Bone.
2, 2. Interossei Muscles.
3, 3, 3, 3. Their tendinous insertion into the first Phalanges of the Toes.

There are two to the first small toe, two to the second, two to the third, and one to the fourth or little toe. The muscles seen on the upper side of the foot, are for the most part double-headed, that is, they arise from the contiguous surfaces of the metatarsal bones.

The INTEROSSEOUS PRIMUS, DIGITI PRIMI PEDIS, or the ABDUCTOR INDICIS PEDIS, is seen superiorly. It is placed between the metatarsal bone of the great toe and the first small toe, and arises, fleshy, by a double head, from the opposed surfaces of their roots and bodies.

It is inserted, tendinous, into the inside of the root of the first joint of the first small toe, and pulls it inwards.

The INTEROSSEOUS SECUNDUS, DIGITI PRIMI, or the ADDUCTOR INDICIS PEDIS, is also external or above. It is situated between the metatarsal bones of the first and second small toes, arising from the opposed surfaces of their roots and bodies by a double fleshy and tendinous head.

It is inserted into the outside of the first phalanx of the same toe by a tendon. It draws this toe outwards.

The INTEROSSEOUS SECUNDUS, DIGITI SECUNDI, or the ADDUCTOR MEDII DIGITI, is seen at the upper part of the foot, between the second and third metatarsal bones of the lesser toes, arising from the opposed surfaces of their roots and bodies.

It is inserted, tendinous, into the outside of the base of the first phalanx of the second small toe. It draws this toe outwards.

The INTEROSSEOUS SECUNDUS, DIGITI TERTII, or the ADDUCTOR TERTII DIGITI, is seen on the upper surface of the foot, occupying the interval of the metatarsal bones of the third and fourth small toes, and arises, by a double head, from the opposite surfaces of their roots and bodies.

It is inserted, tendinous, into the outside of the root of the first phalanx of the third small toe.

It draws this toe outwards.

The INTEROSSEOUS PRIMUS DIGITI SECUNDI PEDIS, or the ABDUCTOR MEDII DIGITI, is at the bottom of the foot, and arises from the inside of the metatarsal bone of the second small toe.

It is inserted into the inside of the first phalanx of the second toe.

It draws this toe inwards.

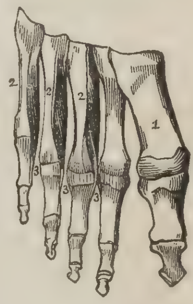
The INTEROSSEOUS PRIMUS, DIGITI TERTII, or the ABDUCTOR TERTII DIGITI, is in the sole of the foot. It arises from the inside of the metatarsal bone of the third toe near its root, and is

Inserted, tendinous, into the inside of the base of the first phalanx of the same toe.

It draws this toe inwards.

The INTEROSSEOUS or ADDUCTOR DIGITI MINIMI is on the under surface of the foot. It arises from the inside

Fig. 157.
PLANTAR INTEROSSEI.



1. Metatarsal Bone of the Great Toe.
2, 2, 2. Interosseous Muscles.
3, 3, 3. Their Insertion into the First Phalanx.

of the base of the metatarsal bone of the fourth small, or the little toe, and is

Inserted, tendinously, into the inside of the first phalanx of the little toe. It draws this toe inwards.

SECTION XIII.

OF THE ARTERIES OF THE LEG AND FOOT.

The Popliteal Artery (Arteria Poplitæa), being the continuation of the femoral after the latter has passed through the adductor tendon, and got to the back of the lower extremity, extends from this point to the opening in the interosseous ligament of the leg, just below the heads of the bones. Its first act is to cross obliquely the os femoris as far as its middle; it then passes in a vertical line downwards, very nearly over the centre of the os femoris, knee-joint, and head of the tibia, being only separated from these parts in consequence of a thick envelop of fat, which fills up the hollow of the ham, and protects the artery from the effects of sudden flexions of the part, and of bruises. The Popliteal Artery sends off the following branches:—

1. The Superior Internal Articular Artery (Articularis Superior Interna) sometimes exists as two trunks; it arises just above the internal condyle, perforates the adductor tendon, and, going horizontally, is spent on the inner side of the joint above.

2. The Superior External Articular Artery (Articularis Superior Externa) arises just above the external condyle, passes horizontally between the femur and the biceps flexor, and is distributed to the upper external parts of the joint.

3. The Middle Articular (Articularis Media) sometimes comes from one of the others; it is distributed to the posterior middle parts of the knee-joint.

4. The Inferior Internal Articular Artery (Articularis Inferior Interna) arises on a level with the inferior part of the internal condyle. It descends obliquely, passes between the lateral ligament and the head of the tibia, and then mounts towards the patella, to be distributed in numerous branches.

5. The Inferior External Articular Artery (Articularis Inferior Externa) arises near the last, and sometimes they are derived from a common trunk. It passes between the external lateral ligament and the head of the tibia, mounts afterwards towards the patella, and is then minutely ramified on the lower external parts of the knee-joint.

The upper articular arteries anastomose with the lower, and also with the anastomotic and the long branch of the external circumflex.

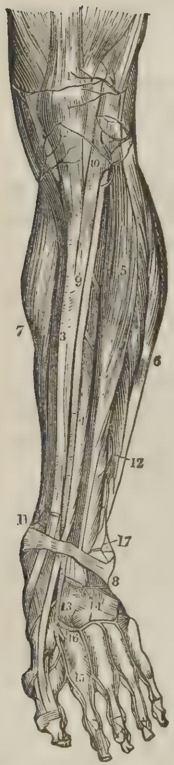
Below the knee, the Popliteal artery is over the popliteus muscle and between the heads of the gastrocnemius. Here it sends off a large branch to each head of the gastrocnemius muscle (Arteriæ Gemellæ) and small irregular branches to the other muscles, and sometimes the nutritious artery of the tibia.

Generally on a level with the aperture of the interosseous ligament, the popliteal artery terminates by a division into two large branches, the Anterior and Posterior Tibial.

The Anterior Tibial Artery (Arteria Tibialis Anterior), after getting through the interosseous foramen, passes down the leg in front of the interosseous ligament and in contact with it; it passes also over the middle of the ankle-joint to the dorsum of the foot, and is continued in a straight line to the interval between the metatarsal bone of the great toe, and of the one next to it. This artery is situated under a line drawn from the middle anterior part of the head of the fibula, to the middle of the ankle-joint in front, and is continued in the course of a line drawn from this latter point to the junction of the first two metatarsal bones. Above, it is placed between the tibialis anticus and the extensor longus digitorum; below, on the leg, it is between the extensor pollicis and the tibialis anticus, and while engaged with the tendons of the muscles under the annular ligament of the joint, it gets to the fibular side of the tendon of the extensor pollicis.

Fig. 158.

A View of the Anterior Tibial Artery.



1. Tendon of the Rectus Muscle.
2. Ligament of the Patella.
3. Tibia.
4. Extensor Proprius Pollicis Pedis.
5. Extensor Communis Digitorum Pedis.
6. Peroneus Longus and Brevis Muscles.
7. Inner Border of the Gastrocnemius and Soleus Muscles.
8. Anterior Annular Ligament.
9. Anterior Tibial Artery.
10. Recurrent Articular Branch.
11. Internal Malleolar Branch.
12. Anterior Peroneal Artery.
13. Dorsal Artery of the Great Toe.
14. Tarsal and Metatarsal Branches.
15. Branch to the Great Toe.
16. Terminal Branch to join the Plantar Arch.
17. External Malleolar Artery.

The anterior tibial nerve adheres to it, its whole length.

The Anterior Tibial Artery gives off several branches.

1. The Recurrent Tibial (Tibialis Recurrens) penetrates the head of the tibialis anticus muscle, and is dis-

tributed about the exterior and anterior part of the head of the tibia, and the patella.

2. Several small arterial twigs are then sent to the muscles and periosteum on the fore part of the leg, but they have no name.

3. The INTERNAL MALLEOLAR (Malleolaris Interna) arises from the anterior tibial near the joint. It passes under the tendon of the tibialis anticus, and is distributed to the internal ankle, and the contiguous part of the foot.

4. The EXTERNAL MALLEOLAR (Malleolaris Externa) exists most commonly as two small branches, one arising on a level with the joint, and the other an inch or two above. They pass beneath the tendons of the extensor longus and the peroneus tertius, to the lower part of the fibula, and inosculate with the peroneal artery.

5. The TARSAL ARTERY (Arteria Tarsea) arises from the anterior tibial just below the ankle-joint. It runs outwardly under the tendons and the belly of the extensor brevis, to be distributed to the upper outer part of the tarsus.

6. The METATARSAL ARTERY (Arteria Metatarsea) arises just below the last, and is distributed by many branches on the upper part of the metatarsus. A successful injection demonstrates a branch of it in each of the three outer interosseous intervals of the metatarsal bones above.

7. The DORSAL ARTERY of the GREAT TOE (Dorsalis Hallucis) arises from the anterior tibial at the root of the first metatarsal bone; it runs into the superior part of the first metatarsal interval, and terminates in two branches, which go to the opposed faces of the great toe and the second toe.

After this, the anterior tibial artery sinks down and joins the external plantar in the sole of the foot.

The POSTERIOR TIBIAL ARTERY (Arteria Tibialis Postica) extends from the head of the tibia to the hollow of the os calcis; it is on the tibial side of the leg, and is placed between the soleus posteriorly, and the flexor digitorum anteriorly, and beneath the fascia of the part. It is distributed in the following manner:—

Fig. 159.

POSTERIOR VIEW OF THE LEFT LEG, SHOWING THE POPLITEAL AND POSTERIOR TIBIAL ARTERIES.

1. Tendons forming the Inner Hamstring.
2. Tendon of the Biceps or Outer Hamstring.
3. Popliteus Muscle.
4. Flexor Communis Digitorum.
5. Tibialis Posticus Muscle.
6. Fibula.
7. Peroneus Longus and Brevis Muscles.
8. Lower part of the Flexor Proprius Pollicis cut off.
9. Popliteal Artery, with its Articular and Muscular Branches—the two Superior Articular seen in the upper angle of the space passing above the cut heads of the Gastrocnemius, the two Inferior in relation with the Popliteus Muscle.
10. Origin of the Anterior Tibial Artery.
11. Posterior Tibial Artery.
13. Peroneal Artery, dividing a little below the number into two branches.
14. Posterior Peroneal Artery.

1. The PERONEAL ARTERY (Arteria Peronea) arises a little below the commencement of the posterior tibial, and is extended from the inferior edge of the popliteus muscle to the external ankle. It is placed at the tibial edge

of the fibula, between the flexor longus pollicis muscle and the external edge of the tibialis posticus. Its situation is therefore deep and difficult of access in the living body. After descending along two-thirds of the fibula, it divides into an anterior and posterior branch. The first traverses the interosseous ligament, and, descending in front of it, is ramified on the upper external part of the foot. The second descends posteriorly along the fibula, and is distributed about the peroneo-tibial articulation and the adjacent parts.

2. Several small, irregular muscular and cutaneous branches afterwards arise from the posterior tibial and at its upper part, most commonly, the Arteria Nutritia Tibiæ.

At the ankle the posterior tibial is at the internal edge of the tendo Achillis, and still confined by the fascia of the part. It passes to the sole of the foot in the hollow of the os calcis, between the bone and the abductor muscles of the great toe. At the ankle it is on a line with the internal margin of the joint behind, and in contact with the posterior malleolus, between the tendon of the flexor longus pollicis, and that of the flexor longus digitorum. Having got to the sole of the foot, it terminates by dividing into two branches, the Internal and External Plantar Arteries.

The Internal Plantar Artery (Arteria Plantaris Interna) is the smaller of the two. It is covered by the abductor pollicis, and, passing between it and the internal inferior margin of the foot, terminates at the anterior end of the first metatarsal bone, in the internal digital artery of the great toe. In this course, it sends several branches to the contiguous parts, which give them a high degree of vascularity. One of the most remarkable is given off about the os scaphoides, and cruizes along the internal margin of the abductor pollicis to its anterior end. Another makes its appearance superficially in the sole of the foot, in the fissure between the abductor pollicis and the flexor brevis digitorum, and goes as far forward as the other.

The External Plantar Artery (Arteria Plantaris Externa) inclines towards the outer margin of the foot, between the flexor brevis digitorum and the flexor accessorius. It then advances at the internal edge of the abductor minimi digiti to the root of the metatarsal bone of the fourth toe, and makes a curvature forwards and inwards, between the tendons of the flexor longus and the metatarsal bones, to the first metatarsal interval, where it is joined by the anterior tibial artery from above. This sweep forms the Plantar Arch (Arcus Plantaris). The distribution of the External Plantar Artery is as follows:—

a. Half an inch from its origin, it detaches backwards and outwards to the inferior and to the external parts of the heel, a multifideous branch, which also sends an arteriole along the external edge of the abductor minimi digiti.

b. At the root of the fourth metatarsal bone a branch raises, called the External Digital Artery of the Little Toe, which goes first along the internal margin of the muscles of this organ, and afterwards at the head of its metatarsal bone, gets between them and the bone, and is distributed along the external margin of the little toe.

c. The Four Digital Arteries come next. These arise successively at the fourth, third, second, and first metatarsal intervals, or near them, from the convex side of the plantar arch, get forward between the transversalis pedis and the interosseous muscles, and arriving at the roots of the toes, each artery bifurcates, and goes to the opposed sides of the adjacent toes, like the corresponding arteries of the hand.

The Digital Artery that supplies the great toe, and the opposite side of the toe next to it, is derived from the united trunks of the anterior tibial and the external plantar. At the head of the metatarsal bone, it detaches a branch which runs along the inner edge of the great toe, and is united, by anastomoses, with the internal plantar artery.

SECTION XIV.

NERVES OF THE LEG AND FOOT.

The PERONEAL NERVE (Nervus Peroneus) divides at the head of the fibula into two branches, the Peroneus Externus and the Tibialis Anterior; but before this division it sends a small branch to the external parts of the knee-joint and two cutaneous branches called Peroneo-Cutaneus. The internal of the latter two descends behind the external head of the gastrocnemius, and at the bottom of the leg is united to a division of the posterior tibial, called the External Saphenus or Communicans Tibiæ. The external branch of the peroneo-cutaneous is distributed to the skin along the fibula.

The EXTERNAL PERONEAL NERVE (Peroneus Externus) gets between the head of the peroneus longus and the fibula, then between the peroneus longus and the extensor longus digitorum; it descends at the outer edge of the last muscle to the inferior third of the leg, giving out, in the mean time, many muscular branches. Here it penetrates the aponeurosis, and divides into subcutaneous branches, which supply the lower part of the leg and the upper surface of the foot and toes. This nerve is called by the French the Musculo-Cutaneus of the leg.

The ANTERIOR TIBIAL NERVE (Tibialis Anterior) gets obliquely between the fibula, the peroneus longus, and the extensor longus digitorum, to the front of the interosseous ligament, where it accompanies the anterior tibial artery. It passes with the artery under the annular ligament of the ankle, and has its terminating filaments going to the muscles and integuments of the upper surface of the foot, as far as the end of the first two toes. One of its branches sinks down with the anterior tibial artery to the sole of the foot. High up in the leg it gives filaments to the knee-joint, and in its course downwards it furnishes the muscles on the front of the leg.

The Posterior Tibial, or Popliteal Nerve (Nervus Poplitæus), having the direction mentioned, is placed between the skin and the popliteal vein. It gets between the heads of the gastrocnemius muscle, and perforates the origin of the soleus, going with the posterior tibial artery between this muscle and the flexor longus digitorum to the bottom of the leg. It gives off

a. The External Saphenus Nerve (Nervus Saphenus Externus, or Communicans Tibiæ), arising above the knee-joint, descends between the skin and the gastrocnemius, turns outwardly and anastomoses with the cutaneous branch of the peroneal nerve before alluded to. The common trunk thus formed passes behind the external ankle, along the external margin of the foot, and terminates on the last two toes, having given off a great number of cutaneous branches.

b. Branches to the heads of the gastrocnemius, soleus, plantaris, and popliteus muscles.

c. Branches to the flexor longus digitorum, tibialis posticus, and flexor longus pollicis pedis muscle.

d. A branch through the interosseous ligament above to the tibialis anticus muscle.

e. At the inferior part of the leg many cutaneous filaments, one of which gets to the sole of the foot.

The Posterior Tibial Nerve, having given off these branches, divides in the hollow of the os calcis into Internal and External Plantar Nerves.

The Internal Plantar Nerve (Nervus Plantaris Internus) proceeds along with the tendon of the flexor muscle of the great toe and the flexor longus, and gives filaments to the contiguous muscles. It then divides in such a way as to furnish the two sides of the first three toes, and the internal side of the fourth.

The External Plantar Nerve (Nervus Plantaris Externus) proceeds with the artery of the same name to the outer edge of the foot, between the flexor brevis digitorum and the flexor accessorius. It is distributed to the two sides of the little toe, and to the external side of the fourth toe. One branch penetrates to the interosseous muscles, and to the transversalis pedis. A branch of considerable size is detached near the heel to the muscles and integuments connected with the os calcis.

CHAPTER X.

OF THE LIGAMENTS.

[The Ligaments may be studied either in connection with the muscles, or subsequently, especially if the joints are in the mean time immersed in spirits of wine.]

SECTION I.

THE LIGAMENTS OF THE JOINTS.

The Ligaments (Ligamenta), properly speaking, are those organs which tie the bones together, and in the movable joints are either Capsular or Funicular. The Capsular Ligaments are like a bag, open at both ends, at either of which the articular extremity of a bone is included, and are much more complete in some joints than in others. The shoulder and the hip-joint afford the most perfect examples of this. In other joints they are divided into irregular fasciculi of fibres, which permit the synovial membrane to appear in their interstices, and sometimes they are still more widely separated.

The Funicular Ligaments are mere cords, extending from one bone to another; some of them are flattened, some rounded, and others oval, or cylindroid. Their names are derived either from their position or shape, and are generally sufficiently appropriate.

SECTION II.

OF THE SYNOVIAL ARTICULAR CAPSULES.

Each movable articulation is lined by a serous membrane, which is reflected over the internal face of the capsular ligament, and the articular cartilages. This membrane is a perfect sac, and, unlike the capsular ligament, has no opening in it. It is remarkably distinct where it is not attached to the articular cartilages, and by being inflated is caused to protrude in small vesicles or pouches between the fasciculi of the ligamentous structure. Its connection with the cartilages, and its continuation over them, is not quite so obvious, and requires more management to demonstrate. It is, indeed, so thin and transparent at this part, and adheres so closely, that its existence has been questioned, but may be proved in a variety of ways, as by maceration, &c.

The SYNOVIAL SACS have on their outer surface, but projecting into the cavity of the joint, adipose cushions of different sizes, called the Synovial Glands of Havers, from which, till lately, it was supposed that the lubricating liquor of the joints was exclusively secreted. These cushions have their projecting margins fringed, are unusually vascular, and occupy the small spaces left between the articular faces of the bones. As they are covered by the synovial membrane, they no doubt assist in the secretion of the synovia.

The movable articulations are all furnished with the fluid called SYNOVIA.

The name Synovia was assigned to this fluid by Paracelsus, from its resemblance to the albuminous portion of an egg, to the consistence and color of which it has a close affinity, and like it is thick, ropy, and somewhat yellowish. It is secreted from the whole internal surface of the synovial membrane, and, perhaps, in greater quantities, from the fringed fatty cushions in the joints, in consequence of their increased vascularity. Mr. Beclard believes that it is neither a follicular nor a glandular secretion, nor a transudation; but a perspiration, in which a perfect equilibrium is kept up between its exhalation and its absorption. Its use is to diminish friction, and consequently, to facilitate the sliding of the bones upon each other.

SECTION III.

ARTICULATION OF THE LOWER JAW.

This articulation is formed by that portion of the glenoid cavity anterior to the fissure, and by the condyle of the lower jaw. Each surface is covered by a thin cartilage, besides which there is an inter-articular cartilage and two synovial membranes, in addition to the ligaments.

The whole joint is invested by a Capsular Ligament, which arises from the margin of the glenoid cavity of the temporal bone, and is inserted into the place where the condyle and neck of the lower jaw unite. This ligament has also an accumulation of fibres internally and externally, which are called the INTERNAL AND EXTERNAL

Fig. 160.
ARTICULATIONS OF THE LOWER JAW.

1. External Lateral Ligament.
2. Internal Lateral Ligament.
3. Inter-Articular Cartilage.

LIGAMENTS. They restrict somewhat the motions of the jaw forwards, and regulate the position of the vessels and nerves, so that they cannot readily be displaced or injured by the various motions of the part.

By cutting open the capsular ligament, we shall see the Inter-articular Cartilage interposed between the glenoid cavity and the condyle, with its upper and under surfaces accommodated to the opposite articular surface of these parts. Two distinct synovial membranes may also be seen, one passing from the movable cartilage to the glenoid cavity, and the other from the lower surface of the cartilage to the condyle. The inter-articular cartilage is attached by its circumference to the internal face of the capsular ligament.

The Stylo-Maxillary Ligament arises from the external side of the styloid process of the temporal bone, and is inserted into the posterior margin of the jaw near its angle, between the masseter and the internal pterygoid muscles.

The stylo-glossus muscle is much connected with it, and is thereby assisted in elevating the base of the tongue. The fascia profunda colli is also in continuation with it.

SECTION IV.

OF THE LIGAMENTS OF THE SPINE.

Intervertebral Substance.—Between the bodies of all the vertebra except the first and second, a fibro-cartilaginous matter is placed, which is fixed to their bodies, and is a very potent means of union. This substance is more fibrous and hard externally, but near its centre is of a pulpy consistence. A horizontal cut seems to demonstrate it as formed of concentric fibres, but there are also many others whose course is oblique and irregular. The central pulpy part is confined by the other, and being also in a state of compression it makes an articulation in some degree equivalent to the ball and socket-joint.

The Anterior Vertebral Ligament is placed on the front part of the spine, and extends from the second vertebra of the neck to the first bone of the sacrum inclusively. It consists of longitudinal white fibres, and increases gradually in breadth from its commencement to its termination. It adheres very closely to the intervertebral substance and to the edges of the vertebræ. Where much motion is admitted, as in the neck and loins, it is thinner than on the dorsal vertebræ.

The POSTERIOR VERTEBRAL LIGAMENT is placed on the posterior part of the bodies of the vertebræ within the spinal canal. It arises from the edge of the foramen magnum, and passing down to the sacrum and os coccygis, adheres to the bodies of the vertebræ and to the intervertebral substance. It is narrower on the bodies of the vertebræ than on the intervertebral substance.

ARTICULATION OF OBLIQUE PROCESSES. All the Oblique Processes have their capsular and synovial membranes, and are faced with cartilage and a synovial capsule.

ARTICULATION OF THE SPINOUS PROCESSES.—Ligamentous fibres pass also between all the spinous processes, except those of the neck, where, owing to the shortness of the processes, an arrangement exists called the LIGAMENTUM NUCHÆ. There are other ligaments also between the transverse processes.

The LIGAMENTUM NUCHÆ, though continuous with those of the spinous processes, may be considered for the sake of perspicuity as distinct. It is a tendinous septum, beginning at the spinous process of the seventh cervical vertebra and running up to the occiput, where it is fixed into the vertical ridge and posterior occipital protuberance. It is connected intermediately to the spinous processes of all the vertebræ above the seventh, so that it forms a partition between the muscles of the two sides of the neck. In quadrupeds, it is remarkably strong; but in man, who, from his erect position, keeps the head nearly balanced, it is comparatively feeble.

ARTICULATION OF THE BONY BRIDGES OF THE VERTEBRÆ.—The intervals between the vertebræ and the posterior part of the spinal canal are filled up by the YELLOW LIGAMENTS, so called from their peculiar color.

There are twenty-three pairs of these ligaments. They pass between the adjoining vertebræ, one on each side, between the spinous and oblique process, and are best seen from the inside of the vertebral cavity. The first pair passes from the bony bridge of the second vertebra to that of the third, and so on successively to the sacrum. They are very elastic, and assist greatly in elevating the spine, when it has been curved out of the proper line.

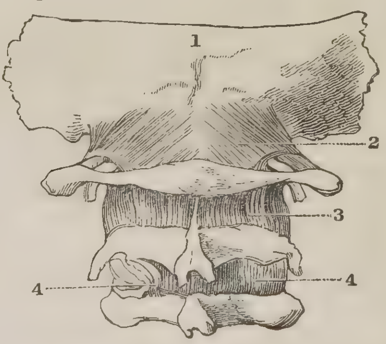
§ 1. PARTICULAR ARTICULATIONS OF THE SPINE.

ARTICULATION OF THE OCCIPUT WITH THE ATLAS.—There is a capsular ligament with its synovial membrane which surrounds on either side the superior oblique process of the first vertebra, and is inserted around the root of the corresponding condyle of the os occipitis.

The condyles and processes are also faced with cartilage.

A circular ligament (Ligamentum Occipito-Atloidien) arises from the whole superior margin of the first vertebra, and is inserted into the margin of the great occipital foramen.

Fig. 161.



1. Occiput.
2. Posterior Occipito-Atloidien Ligament.
3. Posterior Atloidien Dentate Ligament.
4, 4. Second Pair of Yellow Ligaments.

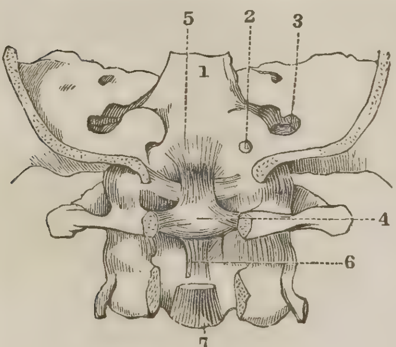
ARTICULATION OF THE SECOND VERTEBRA WITH THE OCCIPUT AND WITH THE FIRST.—The Second Vertebra has no articular surface joining the occiput, but some strong ligaments pass between them. The MIDDLE STRAIGHT LIGAMENT, or the Occipito-Dentate, passes from the point of the processus dentatus, and is inserted into the anterior part of the margin of the occipital foramen.

The MODERATOR or OBLIQUE LIGAMENTS are two in number, one on each side of the tooth-like process, and arising from the lateral margin of the processus dentatus; they are inserted into the inner margin of the condyle of the os occipitis.

The TRANSVERSE LIGAMENT subtends the cavity in the first vertebra, for the reception of the processus dentatus. The upper edge of this ligament is fixed by an appendix to the foramen magnum, and the lower edge into the root of the processus dentatus. It keeps the Processus Dentatus in its place.

Fig. 162.

THE POSTERIOR ARCH OF THE OCCIPUT AND TWO UPPER VERTEBRÆ.



1. Basilar Process.
2. Anterior Condyloid Foramen.
3. Posterior Foramen Lacerum.
4. Transverse Ligament of the Atlas.
5. Its Superior Fasciculus.
6. Its Inferior Fasciculus.
7. Anterior Vertebral Ligament.

SECTION V.

OF THE LIGAMENTS OF THE PELVIS.

The mode of junction between the sacrum and the last lumbar vertebra is, in every respect, the same as that described for the bones of the spine generally, with the addition of a ligament on each side, sometimes met with, called SACRO-VERTEBRAL, which arises from the transverse process of the last lumbar vertebra, and going obliquely downwards is inserted into the superior part of the sacrum by blending itself with the anterior fibres of the sacro-iliac junction.

The Sacrum is united to the Coccyx by a fibro-cartilaginous substance resembling that between the bodies of the true vertebræ, with the exception of there being less pulpy matter in its centre, and of its fibrous lamellæ being more uniform. The bones of the coccyx are also united to one another in the same way; in consequence of which they are very flexible till the approach of old age.

The ANTERIOR COCCYGEAL LIGAMENT is placed on the fore part of the coccyx, runs its whole length, and arises from the inferior extremity of the sacrum. Its fibres are rather indistinct from being blended with fat; on the lateral margin of the coccyx they are better marked.

The POSTERIOR COCCYGEAL LIGAMENT arises from the inferior margin of the spinal canal of the sacrum, and, contributing to finish the canal or to close it up, is then distributed on the back of the os coccygis to its extremity.

The foramina, on the posterior part of the sacrum, are much diminished by ligamentous fibres which pass in every direction.

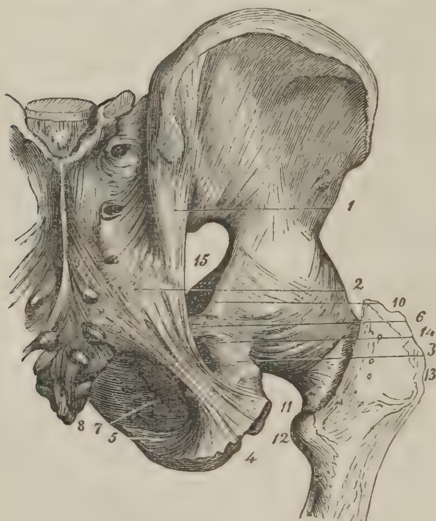
The ILIO-LUMBAR LIGAMENT arises from the transverse and inferior oblique process of the last lumbar vertebra, and going outwards towards the posterior-superior spinous process of the ilium, is inserted into the adjoining part of the crista. It is much mixed with fat. Just below this the SACRO-SPINOUS LIGAMENT is extended between the posterior-superior spinous process and the third and fourth transverse processes of the sacrum.

The SACRO-ILIAC LIGAMENT is an assemblage of very short, strong, compact fibres, which surround this articulation. It is connected to the sacrum by its transverse processes, and by the rough surface just on the iliac side of it. To the ilium it is attached by the rough edge just behind its articular surface with the sacrum. In front, the articulation is covered by short strong fibres.

This ligament is so strong that, in forcing the joint, it does not rupture, but parts from the surface of the ilium, and sometimes brings with it a lamella of bone.

Fig. 163.

Articulations of the Pelvis and Hip.



1. Posterior Sacro-Sciatic Ligament (Vertical Ligament of Bichat), arising from the Sacro-Iliac Junction.
2. Also from the Sacrum and Coccyx.
3. Free Portion of the Ligament, inserted into the Tuber Ischii at 4 and 5.
6. Lesser or Anterior Sacro-Sciatic Ligament.
7. Obturator Ligament.
8. Os Coccygis.
9. Sacral Fasciculus of the Posterior Sacro-Sciatic Ligament.

10, 11. Capsular Ligament of the Hip-Joint.

12. Trochanter Minor.
13. Trochanter Major.
14. Lesser Sciatic Notch.
15. Greater Sciatic Notch.
16. Posterior Sacro-Iliac Ligament.

The bones of the pelvis are also fastened by two other very strong ligaments, which are called the Sacro-Sciatic Ligaments.

The Posterior Sacro-Sciatic Ligament is the larger of the two, and arises from the posterior inferior spinous process of the ilium, from the margin of the sacrum which is below it, from its posterior surface, and from the first bone of the coccyx. As its fibres converge, it becomes thicker in the middle. It is inserted into the ridge at the inner margin of the tuberosity of the ischium, and is prolonged towards the pubes by a continued attachment along the inner margin of the crus of the ischium.

The Anterior Sacro-Sciatic Ligament is much smaller than the other, and has its origin somewhat confounded with that of the posterior. It arises from the margin of the sacrum, and somewhat from its posterior surface, below its junction with the ilium, as well as from the side of all the bones of the coccyx. Its course is more horizontal than that of the posterior, and its fibres converge and are inserted into the spinous process of the ischium.

The two sacro-sciatic ligaments supply in some degree the place of bone, and form a part of the inferior lateral parietes of the pelvis. They convert the sciatic notch into a foramen, or rather form with it two foramina, the upper and larger of which transmits the pyriformis muscle, the sciatic nerve, and the gluteal bloodvessels; while the lower, placed between the insertion of the two ligaments, transmits the obturator internus muscle and permits the internal pudic artery to return into the pelvis.

The Articular Surfaces of the Sacrum and Ilium are covered each with its appropriate cartilage, that on the sacrum being somewhat thicker than the one on the ilium. The contiguous surfaces of these cartilages are rough, and are separated by a yellow, half-fluid, tenacious substance.

The Obturator Ligament is extended across the foramen thyroideum, which it closes, except at the superior part, where the obturator vessels and nerves go out. It is also frequently defective or extremely thin below. The obturator muscles arise from it.

The Articulation of the Pubes is formed between the bodies of the Ossa Pubis, and consists of a fibro-cartilaginous matter which fills up the space between them. It is more fibrous externally, and is there formed of concentric lamellæ which surround the articulation. In men, there is more of this fibrous matter than in women; in the latter, we frequently find, in the posterior part of the symphysis, a little flat oblong cavity occasioned by a distinct plate of cartilage on each bone. This cavity is moistened by a white or yellowish fluid.

From frequent observations made in our dissecting-rooms, I have no doubt that this articulation is always very much relaxed in the parturient and pregnant female, which is manifested, not by the bones separating, but by their sliding upwards and downwards with great readiness. The sacro-iliac junction also becomes relaxed. It was upon the observation of these facts that the celebrated but now exploded Sigaultian operation was founded.

The Sub-Pubic or Inter-Pubic Ligament is a strong tendinous membrane of half an inch in breadth, occupying the very top of the arch of the pubes, and passing from one bone to the other; it is spoken of in the account of the fascia of the pelvis.

In front of this joint there are several other fasciculi of fibres, which get collectively the name of the Anterior Pubic Ligament.

SECTION VI.

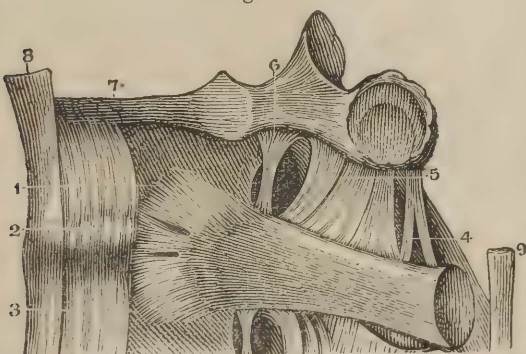
ARTICULATIONS OF THE THORAX.

§ 1. POSTERIOR ARTICULATIONS OF THE RIBS.

The articulations of the bones composing these joints being double, are formed between the heads of the ribs and bodies of the vertebræ, as well as the inter-vertebral matter at one point, and the tubercles of the ribs and transverse processes at the other. In either case, the respective surfaces are covered by articular cartilage and have a synovial membrane. The first joint is called the Costo-Vertebral, and the second the Costo-Transverse.

The Costo-Vertebral Articulation presents an anterior ligament, an inter-articular ligament, and two synovial membranes. The Anterior or Radiating Ligament is fixed, as its name expresses, in front of the joint. It arises from the margin of the head of the rib by the whole breadth of the latter, and, diverging towards the spine, is fixed by its superior fibres into the vertebra above; by its inferior fibres into the vertebra below, and by its middle fibres into the intervertebral substance. The

Fig. 164.



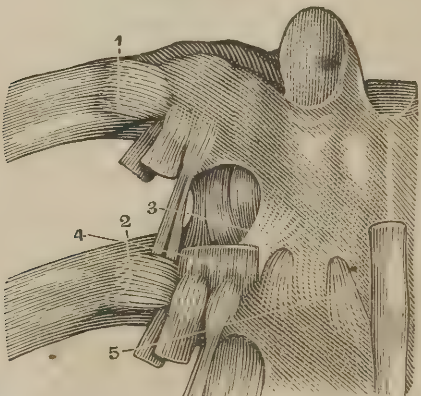
View of the Costo-vertebral and some Contiguous Ligaments.

1, 2, 3. Three Fasciculi of the Costo-vertebral Ligament.
1. Inserted into the Vertebra above.
2. Into the Intervertebral Disk.
3. Into the Vertebra below.
4, 5, 6. Fasciculi of the Anterior Costo-transverse Ligaments.
7. Body of the seventh Dorsal Vertebra.
8. Anterior Vertebral Ligament.

inter-articular ligament passes from the ridge on the head of the rib to a corresponding line of the intervertebral substance. It divides the articulation of the head of the rib into two cavities which have no communication, and it is in consequence of the latter that there are two synovial membranes.

The Costo-Transverse Articulation has, in addition to the joint formed between the tubercle of the rib and the end of the transverse process, several ligamentous fasciculi, which pass in varied directions. Its synovial

Fig. 165.



The Posterior Costo-transverse Articulation.

1, 2. Posterior Costo-transverse Ligaments.
3. Lamello-transverse Ligament, passing from the Bony Bridge to the Transverse Process.
4. Tendon of the Intertransversarii Muscle.
5. Yellow Ligament of the Spine.

membrane is much more distinct than in the preceding articulation, and contains more synovia. There are a few fibres around the joint having the appearance of a capsule.

The Ligamenta Transversaria Interna arise from the inferior margin of each transverse process between its root and external extremity, and proceeding downwards and inwards, are inserted into the upper margin of the neck of the rib below; its fibres run obliquely inwards. The Ligamenta Transversaria Externa arise from between the points of the transverse processes and the back of the ribs just beyond their tubercles; their fibres go outwardly.

The LIGAMENTA CERVICUM COSTARUM are concealed by and pass between the back of the neck of the rib and the front of the corresponding transverse process. To be seen, the rib must be sawed through in its length. These posterior articulations all require a patient dissection, as they are surrounded by small parcels of adipose matter, have the intercostal nerves and bloodvessels in contact before, and the muscles of the spine behind.

§ 2. ANTERIOR ARTICULATION OF THE RIBS.

At its anterior extremity there is a cavity in each rib into which the sternal cartilage fits and is united. This junction is strengthened by short ligamentous fibres surrounding the part and going from the rib to the cartilage, thus presenting an Anterior and Posterior ligament.

The Cartilages of the seven true ribs run into pits in the sternum, and are there secured by the radiated ligaments which lie in front of the joints.

The Sternum is covered, both in front and behind, by a strong ligamentous expansion adhering very closely to it. From the second bone of the sternum, and from the inferior margin of the seventh true rib near it, a ligamentous fasciculus is sent to the cartilago-ensiformis, and is called the COSTO-XIPHOID LIGAMENT.

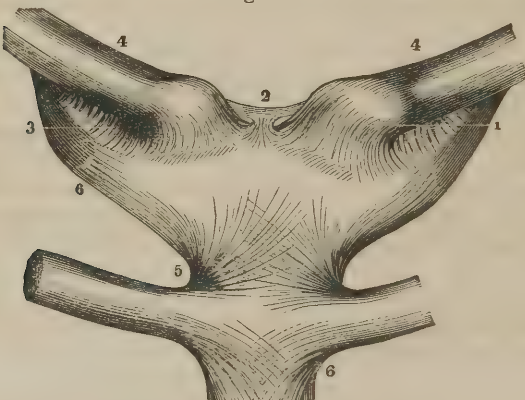
SECTION VII.

OF THE ARTICULATIONS OF THE UPPER EXTREMITIES.

§ 1. OF THE STERNO-CLAVICULAR ARTICULATION.

The Clavicle and the Sternum are very firmly united by the breadth of their articulating surfaces, and by the thickness of their ligaments. The joint is invested by a thick fibrous capsule, the anterior portion of which presents a strong fasciculus of fibres somewhat separated by small interstices. This portion, called by some the Radiated Ligament, arises from the front of the internal end of the clavicle, and is inserted around the margin of the corresponding part of the articular surface of the sternum. The capsular ligament is also strengthened on its posterior surface by additional fibres, sometimes called the Posterior Ligament.

Fig. 166.



Sterno-clavicular Articulation.

1. Capsular Ligament.
2. Inter-Clavicular Ligament.
3. Costo-Clavicular or Rhomboid Ligament.

4, 4. Clavicles.
5, 6. Costo-Sternal or Chondro-sternal Ligaments.

The Inter-Clavicular Ligament is closely connected with the capsule of the preceding joint, and lies on the superior end of the sternum, passing from one clavicle to the other.

The Capsular Ligament can now be seen to proceed from around the internal end of the clavicle, and to be inserted into the margin of the articular surface of the sternum. By cutting it open, we will find that there is a movable inter-articular cartilage interposed between the two bones, connected below with the sternum, above with the clavicle, and by its margin with the internal surface of the capsular ligament, and that on each side of this cartilage there is a distinct synovial membrane.

The COSTO-CLAVICULAR or RHOMBOID LIGAMENT arises from the upper surface of the cartilage of the first rib, ascends obliquely, and is inserted into the tubercle on the inferior face of the clavicle near the sternum.

§ 2. OF THE SCAPULO-CLAVICULAR ARTICULATION.

These exist at three places; the first by a junction between the acromion scapulæ and the external end of the clavicle, and the last two by ligaments sent from the coracoid process to the under surface of the clavicle.

The ACROMIO-CLAVICULAR ARTICULATION is invested by a capsular ligament with its synovial membrane, which unites the acromial end of the clavicle to the acromion process. This ligament being thickened above and below, these parts are called the Superior and Inferior ligaments; occasionally, a movable or inter-articular cartilage is also found in this joint.

The CORACO-CLAVICULAR LIGAMENT is double, one part being called CONOID and the other the TRAPEZOID. It arises from the roughness at the root of the coracoid process, and is inserted into the tubercle near the acromial end of the clavicle. The Conoid having its base upwards is inserted into the tubercle, near the external end of the clavicle. The conoid and the trapezoid ligaments join each other behind, at an angle which is nearly a right angle; they are both very strong and fibrous.

In front of the subclavius muscle, arising from the root of the coracoid process, and going to the clavicle and anterior end of the first rib, is the LIGAMENTUM BICORNE.

§ 3. OF THE SCAPULAR LIGAMENTS.

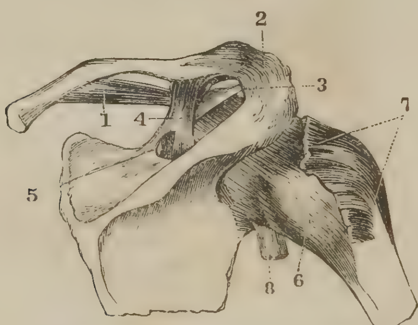
The TRIANGULAR LIGAMENT OF THE SCAPULA, or the CORACO-ACROMIALIS, is extended over the shoulder-joint. Its base arises from the whole outer margin of the coracoid process, and its apex is fixed to the point of the acromion beneath the clavicle. It is thinner in the middle than at either edge.

The CORACOID LIGAMENT of the Scapula is stretched across the coracoid notch, and converts it into a foramen for the transmission of the vessels and nerves.

§ 4. OF THE SCAPULO-HUMERAL ARTICULATION.

The SCAPULO-HUMERAL ARTICULATION is formed by the glenoid cavity of the scapula, and the head of the os humeri. As usual, each articular surface is covered with cartilage. A capsular ligament arises from the neck of

Fig. 167.



SCAPULO-HUMERAL ARTICULATION.

1. Ligamentum Bicorne.
2. Acromio-Clavicular Ligament.
3. Coraco-Acromial Ligament.
4. Coraco-Clavicular Ligament.
5. Coracoid or Supra-Scapular Ligament.
6. Capsular Ligament.
7. Tendons of the Supra-Spinatus, Infra-Spinatus, and Teres Minor Muscles.
8. Tendon of the Long Head of the Biceps.

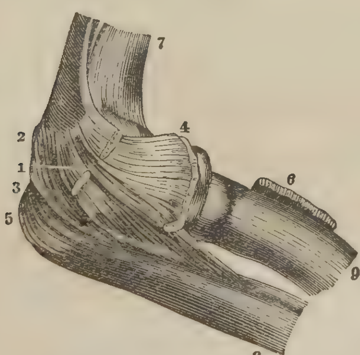
the former, and is inserted into the neck of the latter. A fold or thickening of it, called the ACCESSORY LIGAMENT (Ligamentum Adscititium), passes from the coracoid process towards the great tuberosity of the os humeri.

By cutting open the joint we see the synovial membrane lining its cavity, and sending a process into the bicipital groove of the os humeri, which is afterwards reflected along the tendon of the biceps in such a way as to keep its cavity entire. This tendon is connected with the upper margin of the glenoid cavity, and also with the fibrous ring, called the GLENOID LIGAMENT, which surrounds and deepens the glenoid cavity, by being attached to its edge.

§ 5. OF THE ELBOW-JOINT.

The Elbow-Joint has a capsular ligament arising from the upper margin of the articular surface of the os

Fig. 168.



THE HUMERO-CUBITAL ARTICULATION.

1. External Lateral Ligament, blended with the Extensor Tendons.
2, 3, 4, 5. Capsular Ligament.
6. Tendon of the Biceps.
7. Humerus.
8. Ulna.
9. Radius.

humeri, including its sigmoid cavities, and inserted into the margin of the articular surface of the ulna and into the coronary ligament of the radius. This capsule has additional fibres, internally and externally, called LATERAL LIGAMENTS, or Brachio-Ulnar or Internal, and Brachio-Radial or External. The INTERNAL arises from the internal condyle, and spreads in a radiated manner to be inserted into the inner edge of the coronoid and olecranon process. The EXTERNAL arises from the external condyle, and is inserted into the coronary ligament of the radius.

The CORONARY LIGAMENT OF THE RADIUS arises from one side of the sigmoid cavity of the coronoid process of the ulna, and surrounding the neck of the radius is inserted into the other side of the same cavity. Its upper margin is blended with the capsular ligament, and the lower is loosely attached to the root of the neck of the radius.

On the anterior and posterior surfaces of the capsule of the elbow-joint, there are small and irregular fibres termed accessory ligaments, but the capsule is particularly thin under them, in order to accommodate the flexions of the joint.

By cutting open the capsule, we see the extent of the synovial membrane and the cartilaginous surfaces of the bones. At the bottom of the greater sigmoid cavity of the ulna, a small quantity of vascular adipose matter is found traversing the articular cartilage, and interrupting it.

The INTEROSSEOUS LIGAMENT fills up the space between the radius and the ulna, being fixed on each side to their sharp edges. It is composed principally of oblique fibres, which pass from the radius to the ulna. In it are several perforations for bloodvessels; one particularly large is just at the tubercle of the radius.

There is a small ligamentous band, called the Round

Ligament, at the upper part of the opening for the vessels, which goes from the base of the coronoid process of the ulna to the radius, just below its tubercle.

§ 6. OF THE ARTICULATIONS OF THE WRIST.

Several articular cavities present themselves at this point. One is between the lower part of the ulna and the radius, another between the carpal bones and those of the forearm, and a third between the two rows of carpal bones. One general capsule invests all these parts.

The LOWER RADIO-ULNAR ARTICULATION is formed into a distinct joint, by the lateral projection of the articular cartilage of the radius, between the ulna and the cuneiform bone. The capsule which unites this joint is very loose, and is hence sometimes called the SACCIFORM LIGAMENT.

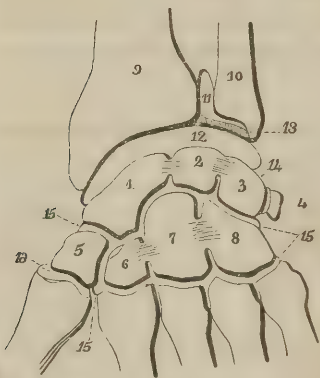
The RADIO-CARPAL ARTICULATIONS are formed between the lower end of the radius and the first three bones of the upper row of the carpus. A capsular ligament passes from the margin of the cartilaginous surface of the radius, and from the part of the same cartilage which is continued between the ulna and the cuneiform bone, and is inserted into the margin of the articular head, formed by the scaphoides, lunare, and cuneiform bones.

The EXTERNAL LATERAL LIGAMENT arises from the styloid process of the radius, and is inserted into the scaphoid bone, the trapezium, and anterior annular ligament. The INTERNAL LATERAL LIGAMENT arises from the styloid process of the ulna, and is inserted into the inner side of the cuneiform bone, and partly into the pisiform and the corresponding part of the anterior ligament, which confines the flexor tendons.

By cutting open this articulation we see the synovial membrane of the part, and a fold of it called by some writers the MUCOUS LIGAMENT, which passes from between the scaphoides and lunare to the radius. We also see the cartilage of the radius projecting between the cuneiform bone and the head of the ulna, and forming, with the head of the ulna, a distinct joint, as stated.

Fig. 169.

ARTICULATIONS OF THE BONES OF THE CARPUS WITH EACH OTHER, AND WITH THOSE OF THE FOREARM AND METACARPUS.



1. Scaphoides.
2. Lunare.
3. Cuneiforme.
4. Pisiforme.
5. Trapezium.
6. Trapezoides.
7. Magnum.
8. Unciforme.
9. Radius.
10. Ulna.
11. Synovial Membrane of the Inferior Radio-Ulnar Articulation.
12. Synovial Membrane of the Radio-Carpal Articulation.
13. Inter-Articular Ligament between the Ulna and Radius, and separating the two preceding Synovial Membranes.
14. Synovial Membrane of the Os Pisiforme.

15, 15. Synovial Apparatus between the First and Second Rows of Carpal Bones, and between the Second Row and the Metacarpus.

16. Synovial Membrane of the Articulation of the Os Trapezium with the First Metacarpal Bone.

The Articulation between the First and the Second row of Carpal Bones is formed by a capsular ligament which goes from the first to the second row, being strengthened laterally by a multiplication of its fibres, constituting lateral ligaments internally and externally. The fibres of the capsular ligament and of the radio-carpal joint are continued into this. There are also several fasciculi of fibres which run in varied directions, some oblique and some transverse, fastening the two rows together, as well as the individual bones of the same row. When this joint is opened we find but one synovial membrane for the two rows of bones, where they are in contact, and this membrane sends in digital processes between the lateral surfaces of the several bones, which are opposite to each other.

There are strong ligaments which go from the carpal to the bases of the metacarpal bones, but owing to the irregular surfaces of these bones, very little motion is allowed, although the apparatus of articulation is complete, with its capsular ligaments and synovial membranes. The metacarpal bone of the little finger has more motion than those of the other fingers; the ring-finger is next; the middle and forefingers being almost stationary.

The Metacarpal Bones of the fingers are connected to each other at their bases by transverse ligamentous fasci-

Fig. 170.

PHALANGEAL ARTICULATION OF THE FINGERS.

1, 2, 3. External Lateral Ligaments.

culi; they are also connected at their heads in the same manner by the inferior palmar ligaments.

A strong capsular ligament, with its synovial membrane, is applied to the articulation between the trapezium and the thumb. This capsule is of nearly a uniform thickness, being very similar in that respect to the capsule of the shoulder-joint, and therefore admits of every variety of motion.

Between the heads of the metacarpal bones and the first phalanges there is a capsule and a synovial membrane. The capsule, being thickened at its sides, thus forms lateral ligaments. In front, it has a cartilaginous thickening which forms a trochlea for the flexor tendon. Behind, it is imperfect, the principal strength being derived from the tendon of the extensor muscle.

The Phalanges are articulated in the same way with each other that they are articulated with the metacarpal bones; thus they have an Anterior Ligament, an Internal and External Lateral Ligament, and a Synovial Membrane.

SECTION VIII.

OF THE ARTICULATIONS OF THE LOWER EXTREMITY.

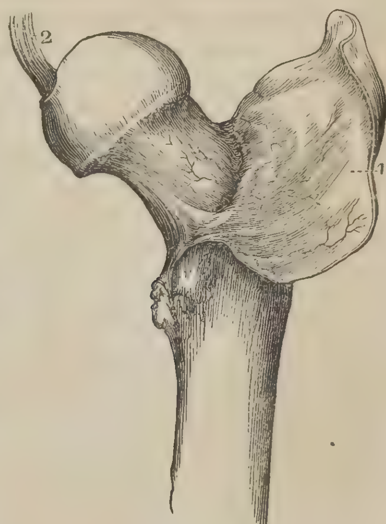
§ 1. OF THE HIP-JOINT.

The Hip-Joint is formed by the acetabulum and the head and neck of the os femoris, these parts being inclosed in a strong capsular ligament, which, arising on the outer circumference of the margin of the acetabulum, is inserted into the root of the neck of the os femoris. The capsular ligament varies in its thickness at different places; in front, it is a fourth of an inch thick; internally, it is somewhat thinner; and posteriorly, where it is covered by the quadratus muscle, it is thinnest. From the anterior inferior spinous process accessory fibres arise, which give to the capsule an increased thickness above, but its strength depends principally on the muscles which surround the joint.

By cutting open the capsule of this joint, we shall see that its internal face, as well as the surfaces of the bones, are covered by a delicate synovial membrane, which is thrown into longitudinal folds on the neck of the os femoris; and that a strong ligamentous cord passes from one side of the notch in the lower part of the acetabulum to the other, leaving an opening below for the introduction of vessels into the cavity of the articulation.

Fig. 171.

VIEW OF THE CAPSULAR LIGAMENT OF THE HIP-JOINT.



1. The Capsular Ligament is separated from the Acetabulum, and is thrown back to show the manner in which it invests and conceals the neck of the Femur.
2. Ligamentum Teres.

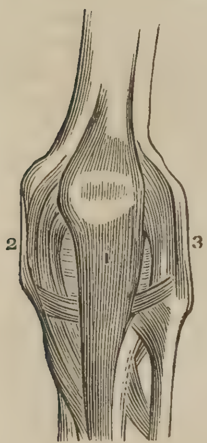
The LIGAMENTUM TERES arises from the pit in the head of the os femoris, and seems to be inserted into the bottom of the acetabulum; but, by dissecting the synovial membrane from it, its insertion into the extremities of the notch of the acetabulum by a bifurcated termination, and into the inferior margin of the cord subtending the notch, will be seen.

The depth of the acetabulum is increased by the COTYLOID LIGAMENT, which surrounds its margin and is within the origin of the capsular ligament. A quantity of loose, vascular, adipose matter fills up the pit in the bottom of the acetabulum, and is covered by the synovial membrane. By some anatomists this is called the Gland of the Hip-Joint.

§ 2. OF THE KNEE-JOINT.

The Knee-Joint is formed by the os femoris, tibia, and patella. The fascia of the lower extremity, in passing from the thigh to the leg, covers this joint in front, as far back as the lateral ligaments, and takes the place of a regular capsular ligament. It is here called INVOLUCRUM.

Fig. 172.
FRONT VIEW OF THE KNEE-JOINT.



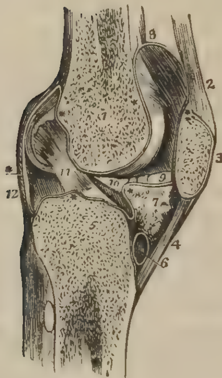
1. Ligamentum Patellæ.
2. Internal Lateral Ligament.
3. External Lateral Ligament.

The EXTERNAL LATERAL LIGAMENT arises from the tuberosity of the external condyle, and is inserted into the head of the fibula. The INTERNAL LATERAL LIGAMENT arises from the tuberosity of the internal condyle, and is inserted into the inner side of the head of the tibia, being continued for some distance down the edge of the bone. The front of the joint is much strengthened by the ligament of the patella, which passes from the point of the patella to the tubercle of the tibia. On the posterior face of the capsular ligament is found an irregular collection of fibres, passing obliquely from the upper back part of the external condyle, to be inserted into the back of the head of the tibia; these constitute the LIGAMENT OF WINSLOW.

By opening the joint in front, so as to let the patella fall upon the tibia, a good view of its internal arrangement may be obtained. The synovial membrane will be seen arising from the cartilaginous margin of the head of the tibia, and around that of the patella; but it is reflected on the front and sides of the condyles of the os femoris, half an inch or more above the margin of its cartilaginous surface. On both sides of the ligament of the patella, and between it and the synovial membrane, a large mass of fat is found, filling up the vacuity between the condyles and the head of the tibia. This fat projects into the cavity of the articulation, and forms on each side of the patella an oblong ridge covered by the synovial membrane. It is called, on the external side of the patella, the Ligamentum Alare Minus, and on its internal portion, the Ligamentum Alare Majus. These ligaments terminate each in a point below the patella, where they are in contact with each other; and from this place a duplicature of synovial membrane, ending on the crucial ligaments, and on the os femoris between its condyles, is extended to the posterior part of the articulation, and is called the Ligamentum Mucosum.

At the posterior part of the joint are fixed the CRUCIAL LIGAMENTS, two in number, the Anterior and the Posterior. The first arises from the internal face of the external condyle, and is inserted in front of the ridge on the top of the tibia; its fibres being partially blended with those of the semilunar cartilages. The Posterior arises from the external face of the internal condyle of the os femoris, and is inserted into the head of the tibia, behind the ridge on its top, some of its fibres being blended with the external semilunar cartilage. These ligaments are exterior to the synovial membrane.

Fig. 173.



A Longitudinal Section of the Left Knee-Joint, showing the Reflection of its Synovial Membrane.

1. The Cancellated Structure of the lower part of the Femur.
2. The Tendon of the Extensor Muscles of the Leg.
3. The Patella.
4. Ligament of the Patella.
5. The Cancellated Structure of the Head of the Tibia.
6. A Bursa situated between the Ligament of the Patella and the Head of the Tibia.
7. The Mass of Fat projecting into the Cavity of the Joint below the Patella. ** The Synovial Membrane.
8. The Pouch of the Synovial Membrane, which ascends between the Tendon of the Extensor Muscles of the Leg and the Front of the Lower Extremity of the Femur.
9. One of the Alar Ligaments. The other has been removed with the opposite section.
10. The Ligamentum Mucosum left entire. The Section being made to its inner side.
11. The Anterior or External Crucial Ligament.
12. The Posterior Ligament. The scheme of the Synovial Membrane, which is here presented to the student, is divested of all unnecessary complications. It may be traced from the Sacculus (at 8), along the inner surface of the patella; then over the adipose mass (7), from which it throws off the Mucous Ligament (10); then over the head of the Tibia, forming a sheath to the Crucial Ligaments; then upwards along the Posterior Ligament and Condyles of the Femur to the Sacculus, where its examination commenced.

The Semilunar Cartilages, two in number, are placed between the tibia and the os femoris. To see them well the last bone must be removed, leaving them on the tibia. They are thick at their exterior circumference, and are brought to a thin edge internally; are fastened to the capsular and the lateral ligament by their outer margin, but the internal is loose, and their upper and under surfaces are covered by the synovial membrane. The internal is longer from before backwards than transversely, and is semicircular; the external is almost circular, in each of which cases they exactly conform to the corresponding articular surface of the tibia. The posterior end of both these cartilages is fixed to the tibia, between the spine on its top and the posterior crucial ligament; their anterior ends are inserted into the tibia before the same spine. Occasionally, a transverse ligamentous band is seen to unite their anterior extremities.

The height to which the synovial membrane ascends above the patella should be noticed by the student, as well as the large bursa just behind the tendon of the extensor muscles, which most commonly communicate with the joint.

§ 3. OF THE PERONEO-TIBIAL ARTICULATION.

The head of the fibula, where it is united to the tibia, has all the apparatus of a movable joint. The capsular ligament is thickened in front and behind, which occasions the names of Anterior and Posterior Ligament. But this joint is particularly strengthened by the insertion of the external lateral ligament of the knee and by the tendon of the biceps muscle.

The INTEROSSEOUS LIGAMENT fills the interstice between the two bones. It is attached to the interosseous ridges which lie on their opposing surfaces, and runs the greater part of their length. It consists of oblique fibres descending from the tibia to the fibula, and forms a thin strong membrane. Just below the head of the tibia there is a large foramen, which transmits the tibialis posticus muscle and the anterior tibial artery and vein. Lower down, it has several smaller foramina for bloodvessels, and near the ankle-joint it gives passage to the fibular artery.

The tibia and fibula are united at the ankle-joint by triangular surfaces, concave on the part of the tibia, and convex on the part of the fibula. These surfaces are held together by intermediate ligamentous matter, as well as a ligament expanded on the front and back of the junction called the Anterior and the Posterior Ligaments. The cartilaginous crust, on the ends of the tibia and the fibula, belonging to the ankle-joint, are continued for a line or two on the opposed surfaces of the tibia and the fibula.

§ 4. OF THE ANKLE-JOINT.

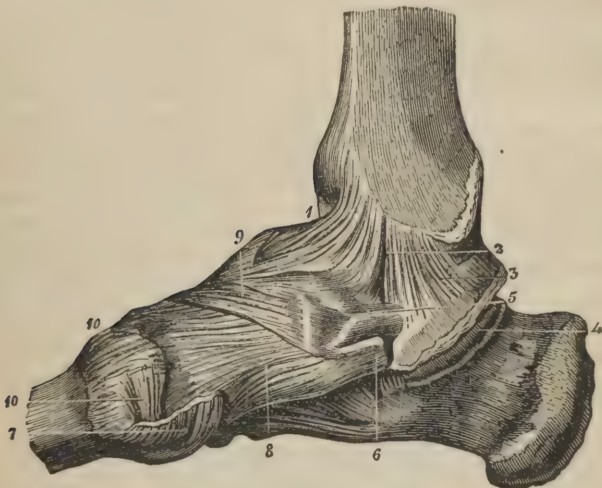
The ANKLE-JOINT is formed by the tibia, fibula, and astragalus. The Capsular ligament is extremely thin, and, indeed, has no very evident existence before and behind, excepting a few scattered fibres. The fatty matter which surrounds the joint is in immediate contact with the synovial membrane, and protrudes it in some places inwards towards the cavity of the articulation.

There are very strong lateral ligaments on both sides. The INTERNAL LATERAL LIGAMENT, also called DELTOID, arises from the inferior extremity of the malleolar process of the tibia, and, by radiating considerably, is inserted into the lesser apophysis of the os calcis and into the internal base of the astragalus. The EXTERNAL LATERAL LIGAMENT is divided into three fasciculi. The Anterior arises from the anterior part of the end of the malleolus externus, and passes obliquely forwards to be inserted into the upper and outer part of the astragalus. The Middle fasciculus arises from the pointed extremity of the fibula, and descends perpendicularly to be inserted into the outside of the os calcis. The Posterior comes from the depression in the extremity of the malleolus externus, and passes very obliquely to be inserted into the outer back part of the astragalus.

On cutting open this joint, it will be seen that the

Fig. 174.

INTERNAL LIGAMENTS OF THE ANKLE AND FOOT.



1. Anterior Fasciculus of the *Deltoid Ligament.*
2. Middle Fasciculus.
3. Posterior Fasciculus.
4. Groove for the Flexor Digitorum Communis.
5. Internal Calcaneo-Scaphoid Ligament.
6. Tendon of the Tibialis Posticus.
7. Tendon of the Tibialis Anticus.
8. Ligament connecting the Os Scaphoides with the first Cuneiform Bone.
9. Ligament connecting the Scaphoides with the Cuneiform Medium.
10. Ligaments connecting the first Metatarsal with the first Cuneiform Bone.

synovial membrane is connected to the several bones at the margins of the cartilaginous articular surfaces.

§ 5. OF THE ARTICULATIONS OF THE FOOT.

The Os Calcis and the Astragalus are united by ligaments investing their articulating surfaces. The synovial capsule belonging to their posterior surface is insulated, but the anterior is extended into that which unites the os astragalus and the naviculare. Between the two bones there is a very strong ligament, called the Interosseous, which arises from the fossa of one to be inserted into the fossa of the other, and is their best means of union.

A small ligament called the Posterior is found at the back of this joint.

The Synovial Membrane forms a distinct cavity on the posterior and large articular surface of the two bones, and is in contact with the fatty matter, in advance of the tendo-Achillo.

The Scaphoides and the Astragalus are united by a capsular ligament with its synovial membrane. This capsule is thickened by additional slips above and internally; the whole arrangement of the joint being such as to admit of much motion.

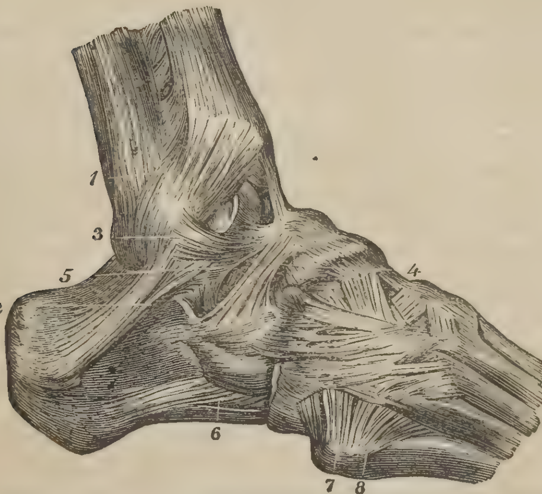
The Os Calcis and Cuboides, besides their articular cartilage and synovial membrane, form a movable joint with a very strong ligamentous fastening, called the Calcaneo-Cuboid Ligaments. The Superior, arising from the upper surface of the Os Calcis, is inserted into the adjoining part of the Cuboides. The Inferior is much the strongest and consists of two laminæ, of which the superficial is the longest; some of its fibres being traced to the basis of the outer metatarsal bone.

A very strong ligament, the Inner Calcaneo-Scaphoid, passes from the interior internal part of the Os Calcis by its lesser apophysis, and is fixed into the inner and under surface of the Scaphoides. This ligament supports the astragalus.

The External Calcaneo-Scaphoid Ligament passes from the greater apophysis of the Os Calcis below, and is fixed to the outer end of the Scaphoides.

There are many other strong ligaments on the dorsal and plantar surfaces of the foot, connecting the bones of

Fig. 175.



THE EXTERNAL LATERAL LIGAMENTS OF THE ANKLE AND FOOT.

1. Anterior Ligament of the Lower Tibio-Fibular Articulation.
2. External Lateral Ligament, sometimes called Peroneo-Calcaneum.
3. Anterior Fasciculus of the same, or Peroneo-Astragalian Ligament.
4. External Calcaneo-Astragalian Ligament.
5. Interosseous Ligament.
6. Lower Calcaneo-Cuboid Ligament.
7. Ligament (Ligamentum Dorsale Obliquum), uniting the Fifth Metatarsal Bone with the Os Cuboides.
8. Dorsal Ligament of the Fourth Metatarsal Bone. The dorsal surface of the foot is covered by smaller ligaments, that connect the tarsal and metatarsal bones, and these again with each other.

the tarsus together; their course is varied and complicated.

The Ligaments of the Metatarsus and Phalanges correspond nearly with those of the metacarpus and the phalanges of the fingers.

CHAPTER XI.

OF THE DERMOID COVERING.

The Dermoid Tissue or Covering of the body consists in the Skin, its Sebaceous Organs, the Nails, and the Hair.

SECTION I.

OF THE SKIN.

The Skin (Pellis, Cutis, δερμα) consists of the Cuticle, Rete Mucosum, and Cutis Vera. These parts are easily separated by maceration; also, by boiling or immersion for a few minutes in hot water, the section thus heated being immediately afterwards thrown into cold water. Vesicatories applied to the living body also cause the Cuticle to detach itself from the Cutis Vera.

The Cuticle is a very thin semitransparent membrane, distributed over almost the whole surface of the body. In some parts, as on the palms of the hands and the soles of the feet, it is from birth much thicker than in others, and from friction and pressure in after life increases farther in its proportionate thickness. The cuticle presents everywhere, but more obviously in the hands and feet, a multitude of furrows caused by the surface of the cutis vera, which are arranged in straight, curved, or spiral lines. It adheres to the cutis vera, and is perforated by the excretory orifices of the sebaceous organs, by the hairs, and, according to some anatomists, by the origin of absorbent and exhalent vessels. The perforations are best seen on the nose, ears, and external parts of generation. From the internal surface of the cuticle, processes are sent in, which line the different foramina of the cutis vera. When the cuticle is raised by a blister these processes become collapsed, in consequence of which their sides are approximated and the fluid effused beneath is prevented from escaping.

The cuticle has but little elasticity, no vascularity, and no sensibility. Its use seems to be to diminish evaporation from the surface of the body, and to shield the pulpy terminations of the nerves of the cutis vera.

The CORPUS, or RETE MUCOSUM, is the second layer of the skin, and on it depends the great variety of colors observed in the human species. It covers every part of the cutis vera, but is not so obvious beneath the nails and at the orifices of mucous membranes. Its consistence is mucilaginous, from which its name is derived.

Mr. Gaultier states that on the soles of the feet, in negroes, the rete mucosum is seen to be disposed in the following manner: 1. On the inequalities of the cutis vera, next to its papillæ, there is a layer, which he calls bloody pimples (Bourgeons Sanguins), but which in the opinion of other anatomists are only the papillæ of the cutis vera; 2. Next to them is a layer called Albida Profunda, on account of its constant color and situation; 3. Then small points, constituting a layer, placed over the last, of a very dark brown, in negroes, which he calls Gemmula; and 4. A layer adjacent to the cuticle, spread over the last, and called Albida Superficialis also, from its color and position.

In cutting through the skin from the heel to the toes, at right angles to its furrows, in negroes, this arrangement may be readily recognized. And in cases where it has been rendered indistinct from sickness, it may be improved by immersing the skin for three or four days in lime-water, a solution of potash or baryta, and afterwards keeping it the same length of time in a solution of corrosive sublimate.

The existence of this arrangement of the rete mucosum may be established in other parts of the body by the effects of blisters. The fluids being thus locally attracted, infiltrate the rete mucosum and separate its layers, in part, so as to form a vesicle, frequently very thick, particularly in fat persons.

The Cutis Vera gives a covering to the whole body. It consists of fibres variously blended, and running in every direction. Its bloodvessels and nerves are so numerous, that the prick of the finest needle in any part will occasion pain and produce blood. Its interior surface is in close connection with the subjacent cellular and adipose membrane, from which it may be imperfectly separated by dissection.* The cutis vera is extremely elastic. Its thickness varies; on the back, on the soles of the feet, and on the palms of the hands, it is thicker than elsewhere. On the lips, and on the margin of the anus and vulva, it is very thin.

The cutis vera, on its external face, is divided by numerous lines running in different directions. When the cuticle is removed, this surface is seen to be studded with small filamentous processes, the papillæ tactus, which are extremely sensitive and vascular. They are very obvious on the palms of the hands and on the soles of the feet, where they are arranged in double rows on the ridges of the cutis vera.

SECTION II.

OF THE HAIR.

The Hair grows in the cellular membrane beneath the skin. It is best studied on the mustachios of the larger animals, as the horse, ox, &c. Around the root of each hair there are two capsules, one within the other. The internal is very vascular. In the root of the hair there is a hollow canal filled with a pulpy substance.

* But maceration is a much more complete way of effecting this separation.

SECTION III.

OF THE NAILS.

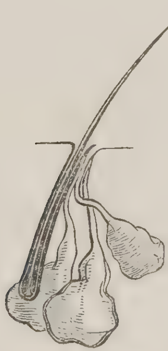
The NAILS are a continuation of the cuticle, but are indebted for their growth to their adhering by their roots and under surface to the cutis vera. If they are torn off by pincers, or separated by maceration, their form and origin may be readily seen.

SECTION IV.

OF THE SEBACEOUS ORGANS.

These consist of follicles and glands. The Follicles secrete an unctuous fluid, which, by inspissation, becomes of the consistence of suet. They are seated in the skin, and are more abundant in some parts; as, for example, on the nose, ears, groins, and external parts of generation, than in others. The follicles are placed also around the roots of the hair in the interior of the capsules.

Fig. 176.



THREE SEBACEOUS FOLLICLES TAKEN FROM THE NOSE, WITH AN ATTENDANT HAIR. THE DUCTS IN THIS INSTANCE OPEN UPON THE CUTICLE.

The SEBACEOUS GLANDS are about the size of millet-seeds, and are placed under the cutis vera. They are particularly numerous under the skin of the Mons Veneris.

The recent investigations of the Dermoid tissues have enlarged our knowledge of their structure so much that the present account can only be regarded as an outline. To enter more fully into their structure would be incompatible with the arrangements of the present work, and those, therefore, who may desire more detailed information are referred to the works on Special Anatomy and Histology.

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